PROCEEDINGS

OF THE

Hawaiian Entomological Society

VOL. VII, No. 2. FOR THE YEAR 1928 DECEMBER, 1929

JANUARY 5, 1928

The 264th regular meeting of the Hawaiian Entomological Society was held at the H. S. P. A. Experiment Station at 2:30 p.m. President E. H. Bryan, Jr. in the chair. Other members present were: Messrs. Crawford, Ehrhorn, Giffard, Hadden, Pemberton, Rosa, Swezey, Van Zwaluwenburg, Willard, and Williams.

Minutes of the 263rd meeting were read and approved.

The secretary reported that the Executive Committee at a meeting held January 5, 1928, had appointed the following officers for the year 1928:

Librarian, F. C. Hadden,

Custodian of Collections, F. X. Williams,

Editor of the Proceedings, O. H. Swezey.

The committee also had approved the payment of a bill in the amount of $137 from The Honolulu Star-Bulletin covering the cost of printing the Index to Vol. VI, Proceedings of the Hawaiian Entomological Society, at a rate of $5.50 per page.

Mr. D. T. Fullaway, who was appointed to audit the Treasurer's accounts for the past year, reported that the audit had been made and the accounts found correct.

Mr. E. P. Mumford was elected an active member of the society.

The secretary read a paragraph from a letter he had received from Mr. J. A. Hyslop, in Charge of the Insect Pest Survey of the U. S. Bureau of Entomology, asking for periodical reports on insect conditions in Hawaii. The members were of the opinion that furnishing such information for the Bureau of Entomology would be a proper activity of the society. Upon motion by Mr. Giffard,

it was voted to designate O. H. Swezey, Exp. Station, H. S. P. A., D. T. Fullaway, Board of Agriculture and Forestry, and J. F. Illingworth, Hawaiian Pineapple Growers Association Exp. Station, as a permanent committee to catalogue the insect pests of Hawaii and to provide information such as that requested in the above communication. The idea was that the committee should bring before the society for consideration any reports on insect conditions in Hawaii that were intended for the insect pest survey of the Bureau of Entomology.

After a lengthy discussion and upon motion by Mr. Swezey, Mr. Giffard was appointed as a committee of one to formulate a resolution setting forth the necessity of obtaining a competent specialist to work on parasitic Hymenoptera in Hawaii.

PAPERS

"Xenos auriferi Pierce in Hawaii," (Strepsiptera).

BY O. H. SWEZEY

NOTES AND EXHIBITIONS

Listroderes apicalis Waterhouse.—Mr. Swezey exhibited the larva of a curculionid beetle, apparently of this species. It had been received from Mr. W. T. Pope of the U. S. Agr. Exp. Station who had received it Dec. 10, 1927 from Mr. Goff in Hilo, Hawaii, where it was reported as injurious to lettuce. This is the first time the larva of this beetle has been observed on Hawaii. The beetles themselves were found quite common by Mr. Swezey in tufts of grass on the Parker Ranch in May, 1926. (See Proc. Haw. Ent. Soc., VI, pp. 360 and 367, 1927.) This is no doubt going to become a serious garden pest, for in California it has recently been reported as becoming a pest on such common garden vegetables as beets, radishes, lettuce, parsnips, carrots, potatoes, tomatoes, etc.

Polistes aurifer Sauss.—Mr. Van Zwaluwenburg reported the collection of hairworms, *Gordius* sp., reared from adults of this wasp by Mr. Swezey.

Amblyteles rufiventris (Brulle).—Dr. Williams exhibited three specimens of this ichneumonid, two were reared July 5, 1925 by

Mr. Swezey from two pupae of *Vanessa cardui*, and the third by F. X. Williams, July 15, 1927, from a pupa of *Vanessa huntera*. All were from Tantalus and were identified by Mr. Cushman as *Amblyteles rufiventris* (Brulle), var. or variation. It has a wide distribution in temperate America.

FEBRUARY 2, 1928

The 265th meeting of the Hawaiian Entomological Society was held at 2:30 p.m. at the H. S. P. A. Experiment Station, President Bryan presiding. Other members present were: Messrs. Ehrhorn, Fullaway, Giffard, Hadden, Illingworth, Mason, Rosa, Swezey, Wilder, Willard and Williams.

The Minutes of the 264th meeting were read and approved as corrected.

Mr. Giffard reported that after conferring with O. H. Swezey, Entomologist, H. S. P. A., and D. L. Crawford, President of the University of Hawaii, he had formulated the following resolution:

"*Whereas* parasitic insects constitute the most important factor of control of insect pests in Hawaii, and

"*Whereas* the success of parasitic control in Hawaii has in the past been possible, in part, because of the employment of highly trained specialists who could immediately study and determine such parasites in their relationships to their hosts as soon as consignments were received from abroad, thereby, in good measure, preventing the introduction and distribution of harmful "secondary" parasites (hyperparasites), and

"*Whereas* there is still much work to be done on similar lines with the more or less minute native parasitic insects which to a great extent are responsible for "nature's balance" in our forests, knowledge of the habits and life histories of which have in the past been so helpful and necessary in local economic entomology, and

"*Whereas* the previous employment of Dr. R. C. L. Perkins and later of Mr. P. H. Timberlake, both trained specialists in these groups, but now unavailable for such immediate work, made it possible to study and determine with dispatch the genera and species of parasitic Hymenoptera particularly the more minute Hy-

menopterous parasites of the group *Chalcidoidea* which have proved so highly beneficial to Hawaiian agricultural and horticultural industries, without having to communicate with other specialists at a distance, and

"*Whereas* local entomologists while abroad on special parasitic field research work need special advice as to the identity of insects to be sent to Hawaii, and since the departure (1924) of Mr. Timberlake, who specialized in the study and determination of such insect parasites, there has been a distinct lack which at some critical time might be exceedingly serious,

"*Be it resolved therefore*—That the Hawaiian Entomological Society urges upon those most interested financially or otherwise, the great need for such a specialist as above indicated and expresses the hope that some eminent, well known and trained specialist on the groups of minute parasitic insects may be brought to Honolulu, and

"*Be it further resolved*—That a copy of these resolutions be sent to the several research institutions in Honolulu for their consideration and for such action as they may deem advisable."

Upon motion by Mr. Swezey, it was unanimously voted to adopt the resolution as read.

Mr. Swezey read a letter and radiogram from Mr. E. P. Mumford who is now in California, asking for a group photograph of the entomologists in Hawaii. It was voted to temporarily adjourn and have the photograph taken.

After the meeting had again been called to order, Mr. Wilder presented to the Society a fasicle of Part IV, Coleoptera, "Insects of Samoa," which is being published by the British Museum.

PAPERS

"The Earliest Described Hawaiian Insects."

BY O. H. SWEZEY

Mr. Swezey read the following paper and presented it for publication:

"Some Remarks on Function as a Base for Classification, and its relationship to Form."*

BY F. MUIR

NOTES AND EXHIBITIONS

Coptotermes formosanus Shiraki on Kauai.—Mr. Fullaway reported that the ground inhabiting termite was found in the vicinity of the landing at Hanalei on January 13, 1928. This is the first record of the insect occurring on Kauai.

Crossotarsus externedentatus Fairm.—Mr. Giffard reported that this scolytid was found dead in more or less numbers embedded in the gum of *Eucalyptus citriodora* situated on the County road at Waialua, Oahu. The tree was full-grown, apparently quite healthy in both branches and foliage, but all the bark on the trunk to a height of over 30 feet was heavily coated with an exudation of dark gum. Examination revealed numerous borer holes into the heart of the trunk and apparently the excessive exudation of gum had been caused by the attack of the borer. It was also noticed that during construction of the County highway, workmen had chopped into the larger root system close to the trunk, and a temporary or otherwise unhealthy condition of the tree may have been the primary cause of the borer attack. The occurrence of similar insect attack on eucalypts on Oahu is uncommon although some other trees, indigenous and introduced, have been found attacked by the same borer—e.g. *Acacia koa* by Blackburn, avocado by Terry and Giffard, and Elaeocarpus, Kukui, Albizzia, Eugenia, and Maba, by Swezey.

Scolytid in Fig tree.—Mr. Giffard stated that during December last after transplanting several full-grown common fig trees (*Ficus carica* L.), he noticed shortly afterwards that the terminal branches of two of these had been attacked by a small borer. Detaching a couple of the smaller terminals for further examination he finally bred from these during the following month a large series of a small scolytid, which has been previously bred from *Ficus bengalensis*. Both fig trees which were attacked were noticeably unhealthy when removed and died before the end of January. From

* Published in Proc. Haw. Ent. Soc., VII, pp. 135-145, 1928.

the same twigs two microlepidoptera were also bred, (*Ereunetis minuscula*).

Apelma brevis Johannsen.—This tiny midge, omnipresent in the water pockets in the axils of pineapple leaves, has been recently described by Johannsen as a new species. (Ent. Soc. Wash. vol. 29, p. 205, 1927). Dr. Illingworth has found the larvae and pupae everywhere in the fields. The flies are easily bred out by keeping the larvae in water with green algae. The pupae are active and somewhat resemble those of mosquitoes. On emerging the flies rest for a considerable time on the surface of the water, and appear loath to fly away.

Telenomus nawai Ashm.—That this armyworm egg-parasite was able to persist through the past summer in the absence of any armyworm outbreaks on Oahu, was noted by Mr. Swezey who had found egg masses of *Spodoptera mauritia* Boisd. on Ficus leaves at Kamehameha School grounds during November, December and January, and always some of them were parasitized. Also he had found two egg-masses of the same moth on Ficus and palm respectively in the park at Waialua Agricultural Co.'s office, Jan. 20, and on one of the egg-masses were 11 of the parasites busy ovipositing, while on the other were 13 parasites.

Bactra truculenta Meyr.—Mr. Swezey reported having found this nutgrass moth established at Waimanalo, Jan. 19, which adds another district to its known dispersal on Oahu.

Larra luzonensis Rohwer.—Mr. Swezey reported finding this mole cricket parasite established at Waimanalo, Jan. 19. This adds another district to its known distribution on Oahu, so that now it probably has reached all places inhabited by the mole cricket.

Athesapeuta cyperi Marshall.—Mr. Swezey announced that he had recently received a name from Dr. Marshall for the barid weevil introduced from the Philippines in 1925 as an enemy of nutgrass, *Cyperus rotundus*. Its larvae bore down the stem and eat out the underground corm. It has already become well established at the Exp. Station, H. S. P. A. grounds, the U. S. Agr. Exp. Station, and the University of Hawaii. Dr. Marshall found it to be a new species, the description of which would appear in an early number of the Bulletin of Entomological Research.*

* Bull. Ent. Research, XVIII, p. 266, 1928.

MARCH 1, 1928

The 266th meeting of the Hawaiian Entomological Society was held at 2:30 p.m. at the H. S. P. A. Experiment Station. President Bryan in the chair. In the absence of the Secretary, the President asked Mr. Van Zwaluwenburg to act in that capacity. Other members present were: Messrs. Ehrhorn, Fullaway, Giffard, Hadden, Illingworth, Mason, Pemberton, Rosa, Swezey and Williams.

The minutes of the 265th meeting were read and approved as corrected.

The Acting-Secretary read letters from Messrs. Agee, Crawford and Dean replying to the Society's resolution recommending the addition of an expert in the Chalcidoidea to the entomological forces of the Territory. No definite action was reported. A letter was read from Mr. J. A. Hyslop regarding the activities of the Society's permanent insect survey committee, in which he suggests monthly reports from this committee.

Mr. Swezey read a leaflet by Dr. C. W. Stiles containing the amendments to the international rules of zoological nomenclature adopted at last summer's Budapest congress. The suggestion that these amendments be reprinted in the Proceedings was approved by the Chair.

Amendments to the International Rules of Zoological Nomenclature

Important Notice to Zoologists, Physicians, Veterinarians, and Others using Zoological Names

[From the PUBLIC HEALTH REPORTS, October 28, 1927, pp. 2639-2640, issued by the United States Public Health Service]

Upon unanimous recommendation by the International Commission on Zoological Nomenclature, the International Zoological Congress which met at Budapest, Hungary, September 4-9, 1927, adopted a very important amendment to article 25 (Law of Priority) which makes this article, as amended, read as follows (*italicized type represents the amendment;* roman type represents the old wording):

ARTICLE 25. The valid name of a genus or species can be only that name under which it was first designated on the condition—

(*a*) That (*prior to January 1, 1931*) this name was published and accompanied by an indication, or a definition, or a description; and

(*b*) That the author has applied the principles of binary nomenclature.

(*c*) *But no generic name nor specific name published after December 31, 1930, shall have any status of availability (hence, also, of validity) under the rules, unless and until it is published either—*

(1) *With a summary of characters (seu diagnosis; seu definition; seu condensed description) which differentiate or distinguish the genus or the species from other genera or species;*

(2) *Or with a definite bibliographic reference to such summary of characters (seu diagnosis; seu definition; seu condensed description). And further—*

(3) *In the case of a generic name, with the definite unambiguous designation of the type species (seu genotype; seu autogenotype; seu orthotype).*

The purpose of this amendment is to inhibit two of the most important factors which heretofore have produced confusion in scientific names. The date January 1, 1931, was selected (instead of making the amendment immediately effective) in order to give authors ample opportunity to accommodate themselves to the new rule.

The Commission unanimously adopted the following resolution:

(*a*) It is requested that an author who publishes a name as new shall definitely state that it is new, that this be stated in only one (i. e., in the first) publication, and that the date of publication be not added to the name in its first publication.

(*b*) It is requested that an author who *quotes* a generic name, or a specific name, or a subspecific name shall add at least once the author and year of publication of the quoted name or a full bibliographic reference.

The foregoing resolution was adopted in order to inhibit the confusion which has frequently resulted from the fact that authors have occasionally published a given name as "new" in two to five or more different articles of different dates—up to five years in exceptional cases.

The three propositions submitted by Dr. Franz Poche, of Vienna, failed to receive the necessary number of votes in commission to permit of their being recommended to the Congress. Out of a possible 18 votes for each proposition, Poche's proposition I received 9 votes, II received 6 votes, and III received 7 votes.

Zoological, medical, and veterinary journals throughout the

world are requested to give to the foregoing the widest possible publicity in order to avoid confusion and misunderstanding.

C. W. STILES, *Secretary to Commission.*

PAPERS

Mr. Swezey presented a paper by Mr. Muir entitled:

"Parallelisms betwen the Insect Fauna of Hawaii and that of Samoa."

A paper: **"Status of Sugar Cane Pests in Hawaii in the year 1927,"** by Mr. Swezey, was read by the author. This is a part of the survey committee's report which has been prepared for Mr. Hyslop's Insect Pest Survey.

NOTES AND EXHIBITIONS

Aphidencyrtus inquisitor (Howard).—Mr. Swezey stated that the secondary parasite of aphids that has been known under the name of *A. schizoneurae* (Ashm.) has been placed as a synonym under *A. inquisitor* (Howard) by Gahan (Proc. U. S. Nat. Mus., 71, No. 2676, art. 4, p. 18, 1927). He also reported having reared this hyperparasite from parasitized aphids on sugar cane in greenhouses at the Experiment Station, H. S. P. A., February 4, 1928. From three leaves infested with *Aphis sacchari*, 63 *Aphelinus maidis* were obtained, and 26 of the *Aphidencyrtus inquisitor*, a hyperparasitism of 29 per cent. This is much lower than some observations made a few years ago, when the hyperparasitism went up to nearly 100 per cent. Five *Lysiphlebus testaceipes* issued from the same lot.

Bactra truculenta Meyrick.—Mr. Swezey reported finding this introduced nutgrass moth established and widely spread at Waianae and Makaha. It is now very generally spread throughout the island.

Xiphidiopsis lita Hebard.—Mr. Swezey reported the finding of this insect at Makaha on February 13. Thus it is now known to have spread to the outer parts of the island of Oahu.

Archytas cirphis Curran.—Mr. Pemberton reported this fly very common on the island of Hawaii from Hilo to Waipio Gulch, in the cane, and doing effective work. This is the first year that no armyworm damage has been reported by the plantations along this coast.

Oxya chinensis (Thunb.).—Mr. Pemberton reported finding this insect at Honokaa, the first record from the Hamakua coast.

Tarsonemus spinipes Hirst.—Mr. Pemberton reported that the common cane stalk mite, previously known here as *T. bancrofti* Michael, has been identified, after comparison with type material by Miss Susan Finnegan of the British Museum, as *T. spinipes* Hirst. This mite is known to occur in Barbados and Porto Rico also.

Copris incertus var. *prociduus* (Say).—Dr. Williams reported the establishment of what seems to be this species or variety of dung beetle on the island of Maui. One specimen was taken February 11, 1928, being exhumed from its rather deep cylindrical burrow at the margin of some cattle manure at Waikapu, on the hills back of Wailuku. The species is well established, as 37 cattle droppings showed signs of the beetle's work. The beetle was introduced in September, 1923, from Orizaba, Mexico, by H. T. Osborn.

Coptotermes formosanus Shiraki.—Mr. Fullaway reported the first case of infestation by this termite on the island of Kauai, where it was found in January at Hanalei, confined to the immediate vicinity of the wharf.

Rice borer.—Mr. Fullaway exhibited specimens of a pyralid stem-borer in rice, found today infesting 129 acres of rice near Ewa, Oahu. No adults have been obtained yet from this material.

Metriona bicolor (Fabr.).—Mr. Bryan exhibited a specimen of this "golden tortoise beetle," which had been collected by S. H. Au, member of the University of Hawaii entomological class, at the Honolulu fish market, Oct. 20, 1927. The presence near the place of capture of various kinds of vegetables brought from California suggests its means of transportation. Essig states that this species of leaf-beetle occurs throughout the North American con-

tinent, feeding on morning glory, sweet potato and related plants, and that it is frequently collected in all parts of California. This capture merely records a new immigrant, and does not mean that another pest new to the islands has become established here.

Mr. Bryan stated that while there are no native species of this family in Hawaii, the tobacco flea beetle, *Epitrix parvula* (Fabr.), and the bronze willow flea beetle, *Diachus auratus* (Fabr.) have been long established here, probably from California.

Brachymeria obscurata (Walker).—Mr. Swezey recorded *Danaus archippus* (Fabr.) as a host for this parasite, for the first time in Hawaii. On February 4, a dozen chrysalids of the butterfly were brought in by Mr. G. P. Wilder who had collected them from leaves of the crown flower, *Calotropis gigantea,* growing in his garden. *B. obscurata* issued from 4 of them February 11-16. The remaining chrysalids appeared dead and were dissected. Dead larvae or pupae were found in 3 of them. The other 5 no doubt had dead parasites in also, but they were not found. On February 14, 21 more of the butterfly chrysalids were brought in by Mr. Wilder. From these, 2 butterflies issued. The rest were dead, and 1 *B. obscurata* issued February 21. The others were dissected and 12 of them found to contain either larva or pupa of the parasite. One chrysalid contained a dead maggot of the tachinid *Frontina archippivora* Will.

APRIL 5, 1928

The 267th regular meeting of the Hawaiian Entomological Society was called to order at 2:40 p..m., at the H. S. P. A. Experiment Station, by President Bryan. In the absence of Mr. Willard, the secretary, Dr. F. X. Williams was appointed to fill the chair for the meeting. Other members present were: Messrs. Ehrhorn, Giffard, Illingworth, Pemberton, Rosa, Swezey, Van Zwaluwenburg, Whitney and Wilder.

The minutes of the preceding meeting were read and approved.

PAPERS

"Records of Immigrant and Recently Introduced Insects on Kauai."

BY O. H. SWEZEY

"Engytatus geniculatus Reuter, an Important Pest of Tomatoes in Hawaii."

BY J. F. ILLINGWORTH

"Preliminary Notes on Pests of Agricultural Crops of Kona, March 15, 1928."

BY J. F. ILLINGWORTH

NOTES AND EXHIBITIONS

The picture recently taken by Mr. Caum of the members of the Hawaiian Entomological Society was exhibited, and distributed at the society's expense.

Nesithmysus bridwelli Perkins.—Mr. Swezey exhibited a fine specimen of this native longicorn beetle found by him in its pupal cell in the trunk of a *Pelea clusiaefolia* tree on Waipio Ridge at an elevation of 1500 feet, March 3, 1928. The trees have numerous tunnels made by the larvae of this beetle. Mr. Swezey had previously collected several larvae, but failed to rear them. This is the first time that the adult has been taken in the Koolau Mountains, though some fragments were found in a *Pelea* tree at an elevation of 2000 feet, Kahana, September 4, 1927. The species was described from Mt. Kaala, where its habit of boring in *Pelea* trees was first discovered on November 11, 1926. The first beetle reared out on January 24, 1927.

Pseudococcus straussiae Ehrhorn.—Mr. Swezey reported the finding of a colony of this mealybug on a leaf of *Gouldia,* on Kaumuahona ridge, Oahu, February 25, 1928. The colony consisted of a single adult female with her numerous offspring surrounding her. *Straussia* is the usual host plant, and this is the first record on *Gouldia.*

Oreocrabro abnormis (Blk. and Cam.)—Mr. Swezey exhibited a male of this wasp reared from a nest found in a fallen, rotten koa log on the Waipio Ridge, Oahu, March 3, 1928. This is a rare wasp, but it has now been taken in widely separated regions on Oahu.

Exillis lepidus Jordan.—Mr. Giffard reported this anthribid beetle as having been bred in numbers by him, from the dead terminal branches of a Plumieria tree—a specimen exhibited.

Lagocheirus obsoletus Thoms.—Mr. Giffard reported seeing a large *Plumiera rubra* tree attacked by coleopterous larvae. The larvae were burrowing deeply into the main branches and portions of the trunk. Later an adult specimen of the cerambycid *Lagocheirus obsoletus* emerged from material gathered. This cerambycid on occasion attacks other trees and shrubs and has been known to kill large specimens of Hibiscus. Both adult, larvae and portion of tree showing where the larvae had bored largely through center of branch and trunk were exhibited. This beetle has been previously reported on Plumieria.

Mr. Swezey stated that *Lagocheirus obsoletus* also bores the living tissue of the Allamanda vine, but that it bred most commonly in dead Kukui (Aleurites) logs.

Oechalia sp.—Mr. Giffard reported having observed in August, 1925, at Kilauea, Hawaii, an *Oechalia* sp. (Hemiptera) preying for over 15 minutes on a caterpillar which was feeding on a fuschia tree. Kirkaldy has reported species of *Oechalia* as preying on the caterpillars of *Omiodes accepta, Scotorythra rara* and others. Specimen of Oechalia and caterpillar exhibited.

*Chilo oryzae**.—Mr. Rosa exhibited larvae, adults and eggs of what is thought to be this species. Mr. Van Zwaluwenburg stated that this Pyralid rice borer can now be found in every rice field on Oahu. The total area affected is between 1500 and 2000 acres. Pupae were taken in rice on March 13, from which adults have since been reared. Although half-grown larvae in captivity do attack corn and sugar cane in the absence of rice, examinations of cane and grass lands immediately adjacent to heavily infested rice paddies have to date failed to show any infestation by this species in sugar cane or wild grasses.

The larvae and pupae taken here correspond closely with Fletcher and Ghosh's descriptions and figures of *Chilo oryzae* (C. S. 1677. See Vol. 1, Proc. 3rd Entomological Meeting, Pusa, p. 390, plates 57, 58, 1919, and Proc. 5th Entomological meeting, Pusa, p. 89, 1923).

Mr. L. A. Whitney of the territorial quarantine office has on two occasions (March 21 and April 4, 1928) taken living larvae of

* It was later on ascertained that this insect is *Chilo simplex* (Butl.), occurring in Formosa and Japan.

apparently the same species in rice straw used as packing in shipments originating in Japan. In the literature *Chilo oryzae* is recorded from India and from Burma. Specimens he sent to Dr. Marlatt at Washington were likewise determined as *Chilo oryzae?*

An animated discussion followed. Certain rice growers have stated that they had first noticed the work of the borer in the fall of 1927. Mr. Whitney spoke of rice straw used in shipping bananas to California, as a possible source of *Chilo* infection and stated that because of this danger one big banana shipper had discontinued the use of this straw in packing. He exhibited two pupae of the rice borer that developed from larvae from rice straw from Japan and two others intercepted two days ago from the same source. He mentioned the interception of 3 species of termites at the port of Honolulu and identified by Dr. T. E. Snyder, as follows: *Kalotermes* (*Cryptotermes*) *piceatus* Sny. (No. 1210), *Coptotermes formosanus* Shir. (No. 1467) and *Kalotermes* (*Cryptotermes*) *piceatus* Sny. (No. 1572-C). A termite collected from the timbers of the wrecked schooner Amaranth, Jarvis Island, August 10, 1924, was *Kalotermes* (*K*) *immigrans* Sny.; and the one from a fallen coconut tree trunk, Washington Island, August 18, 1924, was *Kalotermes* (*Cryptotermes*) *hermsi* Kirby. He showed also an elaterid beetle found in grass packings from Japan, and specimens of the European earwig discovered last November under bark of oak cord-wood from Seattle. The insect, he said, was a bad pest of vegetables in Seattle. He furthermore stated that 17 species of insects had been found some years ago in soil about Spiraea roots. These statements stimulated a discussion of insect immigration and Mr. Pemberton stated that it was a great advantage to the Society to have Mr. Whitney attend the meetings, as often as his duties permitted, and give these important records of insect interceptions.

Mr. Ehrhorn brought up the question of the food of our Hawaiian *Camponotus* ant. Messrs. Ehrhorn, Pemberton and others were of the opinion that the food was not insects but honeydew. Mr. Ehrhorn spoke of the curious clustering habit or hibernation in drawers, etc., of this ant. Mr. Bryan recorded the first termite flight of this year as occurring March 21—and ever since.

Insects of breadfruit tree.—Mr. G. P. Wilder spoke of borers in breadfruit: *Oxydema fusiforme* Woll. in wind-broken branches; Xyleborus also bored dead twigs and the chloropid fly, *Rhodesiella tarsalis* Adams followed after this beetle's work. In addition, four species of nitidulid beetles were found associated with the tree.

Ergates spiculatus (Lec.).—Mr. Swezey exhibited the large obese larvae of the pine sawyer, *Ergates spiculatus,* a Pacific coast beetle that was recently found as larvae in coniferous lumber at Kahului, Maui. Several of the large larvae were found in imported nor'west lumber in Oct. and Nov., 1927.

Buprestis aurulenta L.—Mr. Bryan mentioned that a specimen of the metallic green buprestid, *Buprestis aurulenta,* had been taken by one of his students.

Proterhinus, balsam mount.—A very fine balsam mount of a Proterhinus beetle, with the adeagus dissected out and alongside was exhibited by Mr. Giffard.

MAY 3, 1928

The 268th regular monthly meeting of the Hawaiian Entomological Society was held at 2:30 p.m. at the Experiment Station, H. S. P. A. President E. H. Bryan, Jr. presiding. Other members present were: Messrs. Ehrhorn, Giffard, Illingworth, Mason, Rosa, Swezey, Van Zwaluwenburg, Wilder and Willard. Mr. E. W. Rust was a visitor.

Minutes of the 267th meeting were read and approved.

The secretary read letters from Dr. L. O. Howard and S. A. Rohwer, relative to the resolution passed by the Society at its February meeting.

PAPERS

"List of Lepidoptera at the Bishop Museum collected by J. August Kusche on Kauai in 1919 and 1920."

BY O. H. SWEZEY

"Sitophilus rugicollis (Casey) in Hawaii."

BY O. H. SWEZEY

"Pests of pineapple in Hawaii."

BY DR. J. F. ILLINGWORTH

NOTES AND EXHIBITIONS

Amblyteles rufiventris (Brulle).—Mr. Swezey reported that Dr. Williams had collected two specimens of this ichneumonid at Pepeekeo, Hawaii, March 22, 1928. It is the first recovery of this parasite from the island of Hawaii.

Callithmysus microgaster Shp.—Mr. Swezey exhibited a fine specimen of this longicorn beetle which he had reared from a larva found beneath the bark of a fallen Bobea tree, on the Pupukea-Kahuku Military trail, Feb. 15, 1928. This larva was put into a piece of sugar cane, and matured in April, the beetle having issued prior to April 18, when it was found dead in the cage.

Chilo simplex (Butl.).—Mr. Rust read several interesting letters from Mr. D. T. Fullaway, relative to his search in Japan for parasites of rice stem borer, *Chilo* sp. During the discussion which followed the reading of these letters, Mr. Van Zwaluwenburg stated that Mr. C. P. Clausen, who passed through Honolulu about two weeks ago, was of the opinion that the moth known as *Chilo simplex* in India, was entirely different from the one called *Chilo simplex* in Japan.

An interesting discussion took place relative to the advisability of placing a quarantine upon the entry of rice straw from the Orient into the United States. It seemed to be the opinion that such a quarantine would be very desirable if some substitute could be found to be used as packing material in shipments of merchandise from the Orient. The matter of fumigating rice straw under the supervision of officials in the country of origin did not seem to meet with much favor. The members thought that not enough is known of effective methods of fumigating rice straw, and that such packing material originates in so many parts of the Orient that fumigation at the point of origin would not be practicable.

Samoan ants.—Mr. Bryan exhibited a large collection of Sam-

oan ants that had just been returned from the British Museum where they had been sent for identification.

Cryptotermes piceatus Sny.—Mr. Bryan exhibited a specimen of this termite which he found boring through the paper into a package that had just been prepared for mailing. The package had been wrapped only a short time and the finding of the termite, that had bored so far into the package that it was nearly concealed, shows how easy it is for insects to be carried by the movement of merchandise.

Lagocheirus obsoletus Thoms.—Mr. Wilder exhibited a specimen of this longicorn beetle found attacking the Allamanda. Eggs were deposited on the younger growth, where the newly hatched larva could enter easily. After reaching the pithy part of the stem the larva works downward into the older growth. When full-grown it forms a cocoon at the end of the channel where it pupates, the adult boring out through the stem. This beetle usually kills the plant.

A new host for Cremastus hymeniae Vier.—Mr. Rosa exhibited a specimen of this parasite that was reared from *Chilo simplex* collected in a field at Aiea on April 7, 1928. The adult issued on April 12th. The cocoon of *C. hymeniae* was found in a rice stalk in a cavity made by a *simplex* larva. The remains of the larva and larval head were found in this cavity together with the *C. hymeniae* cocoon. Comparison by Mr. Swezey of this larval head with another of about the same instar showed them to be the same.

JUNE 7, 1928

The 269th meeting of the Hawaiian Entomological Society was held at 2:30 p.m. at the Experiment Station, H. S. P. A. President Bryan presiding. Others present were: Messrs. Crawford, Illingworth, Rosa, Rust, Van Zwaluwenburg, and Willard. Mr. A. M. Adamson was a visitor.

Minutes of the previous meeting were read and approved as corrected.

Mr. E. W. Rust was elected an active member of the Society.

Mr. Bryan read a communication from Dr. Herbert E. Gregory, Chairman Committee on Pacific Investigations, National Re-

search Council. This communication stated that the officers of the fourth Pacific Science Congress to be held in Java, May 16th to 25th, 1929, had requested the National Research Council to compile lists of scientists to whom invitations should be extended. Dr. Gregory stated that the Committee on Pacific Investigations had voted to select entomologists from a list prepared by the entomologists residing in Hawaii, and the Hawaiian Entomological Society was asked to submit a list of about 20 men resident in the United States, exclusive of Hawaii and the Philippines.

Upon motion by Mr. Van Zwaluwenburg, it was voted that the chairman appoint one member to serve with the president in the preparation of such a list to be presented for approval at the next meeting. An extended informal discussion followed during which a number of men were suggested who are outstanding entomologists, with particular interest in the Pacific area, and whose names should be included in the list.

The secretary read a communication from Dr. C. L. Marlatt, Chief, Bureau of Entomology, Washington, D. C., which gave the results of an examination by Mr. Carl Heinrich of some specimens of the rice stem borer *Chilo* sp. which were forwarded to him on April 12th. The note from Mr. Heinrich is as follows:

"Det.—*Chilo* sp. This equals what we have in the collection as *Chilo simplex* (Butler) from Japan and the Philippines. It is probably that species and not *oryzae,* which is an Indian species. It is very doubtful if all that have been determined as *simplex* (especially from India) are that species. *Simplex* was originally described from Formosa and I'm inclined to think it is what they have in Hawaii."

Pleistodontes imperialis Saund.—Mr. Van Zwaluwenburg presented the following note for Mr. Swezey. This fig wasp was recovered by Mr. McEldowney at the Wahiawa nursery May 28, and at Manana the following day. Young trees of *Ficus rubiginosa* there have come into bearing, and are now producing fertile seeds, due to the presence of the wasp. It has reached the place itself, as none were ever taken there for liberation. This indicates the ability of this insect to spread around to wherever there may be bearing trees of this fig.

Chilo simplex (Butler).—Mr. Van Zwaluwenburg stated that

on May 31, in company with Mr. Rust and Mr. Rosa, at Honouliuli, he found the larvae of this rice-borer in the so-called "rice-grass" which is so common in rice fields. This grass was identified by Mr. E. L. Caum as *Echinochloa* probably *crusgalli* (L.). This is the first time that this insect has been found in the field on Oahu in any host other than rice. The infestation was rather common in fields of ripe rice, various instars of the larvae being found in this grass. On the same date several adults of *Polistes hebraeus* (Fab.) were observed preying upon *Chilo* larvae that they had either dragged from infested rice stubble or had found wandering about over the dried straw of harvested fields. The larvae were cut into pieces by the wasps, and the fragments worked into round balls preparatory to flying off with them. The wasps were very abundant flying low over the harvested paddies evidently scouting for the borer larvae. Among them was noted one *Polistes aurifer* Sauss. cruising about in the same fashion, but during the time this individual was observed it did not find a larva.

Mr. Rosa stated that on June 6 one adult of *Polistes hebraeus* (Fab.) was observed flying away with a *Chilo* moth. Another *Polistes* of the same species was found on a leaf of the so-called "rice grass" chewing another moth and working it into a ball.

Archytas cirphis Curran.—Dr. Illingworth stated having observed this parasitic tachinid very generally abundant. It is now abundant in Manoa Valley, around the University of Hawaii. Specimens come into his laboratory frequently. The flies are also abundant all over Kaimuki, even in the dry vacant lots. This is in marked contrast to the humid district along the Kona Coast of Hawaii, where he had recently found that the flies had thoroughly established themselves.

Scolia manilae Ashmead.—According to Dr. Illingworth this wasp is now exceedingly abundant in all of our pineapple growing districts, on all the islands. Hundreds of the males may be seen on any bright morning, flying over the surface of the ground in a single row. They pounce upon the females as they emerge from the soil. He has also noticed thousands of the wasps in the weed patches in vacant lots at Kaimuki. Since this parasite is now feeding almost exclusively upon the grubs of *Adoretus sinicus* Burm., we should soon see a marked reduction in the devastation caused by the rose beetles.

New Immigrant Beetles.—Mr. Bryan exhibited specimens of the following beetles which had been collected by members of his entomology class at the University of Hawaii. The determinations and notes are those of Professor E. C. Van Dyke, to whom the specimens were sent for identification. The specimens are in the University of Hawaii collection.

Stenolophus limbalis Lec.—University of Hawaii Farm, 1927, (C. E. Ashton).

"A rather common and widely spread species in middle and southern California."

Bembidium pacificum Black.—Honolulu, 1926, (Asao Doi); Honolulu, 1926, (K. P. Kawasaki); Kapaa, Kauai, 24-XII-27, (K. Ito).

"Your specimens run to what I have named in my collection as *pacificum.*"

**Tarsostenus univittatus* (Rossi).—University of Hawaii Farm, 21-XII-27, (M. Maneki); also Honolulu, on dead wood, 22-IX-19, (C. E. Pemberton) in H.S.P.A. collection.

"A rather common Mexican clerid, often found in the mesquite or algaroba. It no doubt lives at the expense of some of the small species of Lyctus."

Agrilus sp.—A small buprestid, probably the same as that reported by Sharp in the Fauna Hawaiiensis, III, p. 400, 1908, as the specimen agrees with those in the Bishop Museum, was captured on the University of Hawaii Farm, 15-IX-27, by M. Maneki. Concerning it Professor Van Dyke writes, "It does not seem to agree with any of ours. It also may be Mexican."

Haltica sp.—Specimens of a chrysomelid captured on Maui, 1-I-15, were identified by Mr. Swezey as near *Haltica carinata.* Professor Van Dyke says, "This does not agree with *carinata* nor with any species that I am familiar with in this country. It may be Mexican."

JULY 5, 1928

The 270th regular meeting of the Hawaiian Entomological Society was called to order by President E. H. Bryan, Jr., at 2:30 p.m., at the Experiment Station, H. S. P. A. Other members present were: Messrs. Adamson, Illingworth, Mason, Rosa, Rust, Van Zwaluwenburg, and Willard. The following visitors were present: Dr. J. G. Needham, Professor of Entomology and Limnology, Cornell University; Dr. M. F. Guyer, Professor of Zoology, Uni-

* This is the undetermined clerid beetle recorded on page 359, Proc. Haw. Ent. Soc., IV, 1920. [Ed.]

versity of Wisconsin, and Dr. C. H. Edmondson, Professor of Zoology, University of Hawaii.

The minutes of the 269th meeting were read and approved.

The president introduced Prof. Needham who was returning from a year's visit to China, where he had been spending his sabbatical year studying the entomological situation and collecting insects. Dr. Needham gave a very interesting description of entomological work in China, describing the small Bureau of Entomology there, and calling particular attention to the difficulties under which entomologists in that country were obliged to work. Unsuitable housing and inadequate equipment were the principal handicaps.

Dr. Guyer was then introduced by the president and gave a brief talk.

Mr. A. M. Adamson was elected an active member of the society.

A report of the committee to recommend names of mainland entomologists who should be invited to attend the Science Congress in Java in 1929 was rendered. It was decided to bring this report up for discussion at the next meeting.

PAPER

"Grasshoppers Eat Pineapple Mealybugs and Other Pests."

BY DR. J. F. ILLINGWORTH

NOTES AND EXHIBITIONS

New Jassid on Tamarix.—Mr. Van Zwaluwenburg reported that Dr. Lyon had brought in a jassid which is seriously injuring *Tamarix aphylla,* and which appears to be an importation from California. He had noted it only within the past week. It is unlike anything in the Station collection and may prove to be *Eutettix osborni* Ball which has been recorded from California and Texas, and said by Olsen to be a synonym of *Euscelis* (*Athysanus*) *stactogallus* Fieb.

Unidentified Ichneumonid.—Mr. Van Zwaluwenburg exhibited some specimens of an unidentified ichneumonid reared from the rice stem borer *Chilo simplex* collected at Honouliuli by Mr. Rust.

This parasite is apparently new to Hawaii and the specimens have been sent to Washington for identification.

Reticulitermes speratus Kolbe.—The secretary reported for Mr. Whitney that a colony of termites intercepted by him in flowering *Prunus* sp. in baggage from Japan, had been identified by T. E. Snyder of the U. S. Bureau of Entomology as *Reticulitermes speratus*. The following quotation is from Dr. Snyder's letter: "These specimens are nymphs of sexual winged adults, soldiers, and workers of *Reticulitermes speratus* Kolbe, native of Japan. This is a very important interception, since as you know species of *Reticulitermes* are very destructive not only to the woodwork of buildings and their contents but also to vegetation."

AUGUST 2, 1928

The 271st regular meeting of the Hawaiian Entomological Society was called to order by President E. H. Bryan, Jr., at 2:30 p.m. at the Experiment Station, H. S. P. A. Other members present were: Messrs. Giffard, Illingworth, Mason, Rosa, Rust, Van Zwaluwenburg, and Wilder. Mr. W. B. Gurney, Government Entomologist of New South Wales, Australia, was present as a visitor.

In the absence of the secretary, the president appointed A. C. Mason to serve as secretary pro tem.

The minutes of the 270th meeting were read and approved after slight alterations.

The president reported that the society had recommended and forwarded to Dr. Gregory, Chairman of the Committee on Pacific Investigations of the National Research Council, the names of the following twenty mainland entomologists to be invited to attend the Fourth Pacific Science Congress in Java, May 16 to 25, 1929: Prof. J. M. Aldrich, Dr. E. A. Back, Prof. T. D. A. Cockerell, Prof. G. C. Crampton, Prof. R. W. Doane, Prof. E. O. Essig, Dr. H. E. Ewing, Prof. W. B. Herms, T. E. Holloway, Dr. L. O. Howard, J. A. Hyslop, Prof. V. L. Kellogg, Prof. Trevor Kincaid, Prof. H. H. Knight, Dr. C. L. Marlatt, Prof. A. L. Melander, Prof. H. J. Quayle, Dr. Thomas E. Snyder, Prof. E. C. Van Dyke, Prof. W. M. Wheeler.

The president then introduced to the society Mr. Gurney, who made a short address concerning his work in New South Wales. He also showed a box of specimens of injurious insects of Australia. Among the important pests, he mentioned: blow flies of sheep, white grubs in wheat, codling moths in fruits, red scale and white wax scale on citrus, and *Chloridea obsoleta* on alfalfa and certain fruit trees. Mr. Gurney is on a trip around the world and plans to attend the International Congress of Entomology at Cornell University, Ithaca, N. Y., Aug. 12-18, as well as to visit entomologists elsewhere in America and Europe. He expressed his pleasure of his visit to Hawaii, and appreciation of the help given him by the various members of the society while here. He also mentioned especially his gratitude to Mr. Swezey for sending a shipment of *Scolia manilae* to him at New South Wales.

NOTES AND EXHIBITIONS

Rice Borer and Adoretus Parasites.—Mr. Rust reported on the progress of parasite introduction for the rice stem borer and Adoretus. To date, 33,000 *Trichogramma japonicum* and 21,000 *Phanurus beneficiens* have been liberated in rice fields at Honouliuli, Kailua, and Kaneohe. Several cages of Japanese beetles parasitized by the yellow *Ochromeigenia ormioides* Towns. have been received from Messrs. Fullaway and Hadden. No liberations have yet been made. *Cremastus hymeniae* has been observed in rice fields. A very similar insect, *Cremastidea chinensis* Vier., has been received from Japan. Cocoons of another larval parasite, *Amyosoma chilonis* Vier., have also been received.

Field hosts of Chilo simplex.—Mr. Van Zwaluwenburg mentioned the following new hosts of the rice stem borer recently found: *Echinochloa crusgalli* var. *cruspavonis* (H. B. K.) barnyard grass; infestation often so severe as to kill the grass. This grass is undoubtedly the most important host of the borer on Oahu between rice crops. *Echinochloa stagnina* (Retz.) Beauv., rice grass, not previously known from these islands. *Eleusine indica* (L.), goose grass. *Chaetochloa verticillata* (L.), foxtail grass. *Panicum barbinode* Trin., panicum grass. *Paspalum conjugatum* Berg., Hilo grass. Only short tunnels were found in this grass, indicating that it is too hard for the borer, or distasteful to it.

*Tamarix jassid**.—Mr. Van Zwaluwenburg reported that the new jassid attacking *Tamarix aphylla* reported for the first time at the last meeting of this Society, apparently attacks all trees of the genus indiscriminately. It has lately been taken at the H. S. P. A. Vineyard Street nursery on *Tamarix aestivalis, T. indica* and *T. africana.* The eggs of this insect are laid singly just under the epidermis of the woody growth, usually transversely with reference to the axis of the branch. Several specimens of what appears to be a primary egg-parasite have been reared; these have been referred to Mr. Timberlake for identification.†

Mr. Bryan reported that Mr. Adamson is now on his way to the Marquesas and Society Islands for a two years' trip in the interest of the Pacific Entomological Survey.

Mr. Van Zwaluwenburg reported that Mr. Pemberton had reached New Guinea and was making plans for a trip to the interior of the island in search of native sugar canes.

SEPTEMBER 6, 1928

The 272nd meeting of the Hawaiian Entomological Society was held at the Experiment Station, H. S. P. A., 2:30 p.m., President E. H. Bryan presiding. Other members in attendance were: Messrs. Crawford, Ehrhorn, Illingworth, Mason, Van Zwaluwenburg, Wilder, Willard and Williams.

The minutes of the 271st meeting were read and approved.

PAPER

Dr. F. X. Williams presented **"Notes on the habits of the cockroach-hunting wasps of the genus Ampulex, sens. lat., with particular reference to Ampulex (Rhinopsis) caniculatus Say."**

NOTES AND EXHIBITIONS

Mr. Ehrhorn reported briefly on his impressions gained at the meetings of the American Association for the Advancement of Science, Pacific Division, and the Pacific Slope Branch of the

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* *Euscelis stactogalus* Am., det. by W. L. McAtee.

† Mr. Timberlake identified this egg-parasite as *Polynema saga* (Girault).

American Association of Economic Entomologists, which were held in Claremont, California, June 14, 15.

Termites in California.—Mr. Ehrhorn gave a talk on some of his observations on termites in California, both south and north. Much damage is being done by subterranean and dry-wood termites. There are eight species recorded from California. *Reticulitermes hesperus* is doing much damage to houses in many cities. *Termopsis angusticollis* also does damage to piling and walnut trees. *Kalotermes* does similar damage to interior work as does our *Cryptotermes.* Very little work has been done in the past to check termite damage in California, and only in the last six months has a real campaign been started. Mr. Ehrhorn exhibited specimens of *Reticulitermes hesperus* in all stages, also young and soldiers of *Termopsis angusticollis* and *Kalotermes minor.* He also showed large photographs of the earthen tubes of *Reticulitermes* starting direct from a nest and reaching the floor timbers and pipes under buildings. Also photographs of damaged dwellings.

Mr. Bryan reported giving a talk on termites before the Chamber of Commerce of Kauai where damage by *Coptotermes formosanus* had been found in the wharf at Hanalei. This infestation, the only one found on Kauai by this species had been under treatment by the Territorial Entomologist for some months. A very careful examination of the wharf was made by Mr. Bryan during his visit to Kauai which resulted in his finding evidences of termite work but no living termites were found.

Geococcus radicum Green.—Dr. Illingworth exhibited a root-cage with roots of pineapple plants infested with this mealybug. This pest has been previously reported on the roots of potted mango plants, koa and nutgrass. (See Proc. Haw. Ent. Soc. II, 108.) Mr. Ehrhorn determined the specimens on pineapple as belonging to this species and stated that he had also found it on palm roots, ferns, Caladium roots, and potted plants in general. It was originally described from Ceylon. This mealybug is very prolific on the roots of pineapple, especially when grown in observation boxes and root-cages. It is yet to be seen whether they multiply in this way in the field.

Tamarix leafhopper.—Mr. Van Zwaluwenburg reported that the jassid recorded previously from *Tamarix* spp. has been determined by Mr. W. L. McAtee as *Euscelis stactogalus* Am. This is

a European species described by Ball from California and Texas as *Eutettix osborni* on *Tamarix gallica*. It was also collected in Ohio and Missouri.

Nesopimpla naranyae Ashm.—Mr. Van Zwaluwenburg stated that Mr. R. A. Cushman has identified as this species the large ichneumonid bred from stems of rice infested by *Chilo simplex* (Butl.), and believed to be parasitic on this pyralid. A synonym according to Cushman is *Itoplectis immigrans* Timberlake. Timberlake appends the following to his original description (P. H. E. S., IV, p. 275, 1920): "This species does not occur on Oahu apparently, as it can hardly be the undetermined *'Pimpla'* species mentioned by Perkins (Fauna Hawaiiensis, 2, pt. 6, 1910, p. 676), since under any ordinary circumstances it would not be called 'commonplace'." As a matter of fact the insect under discussion was numerous enough in rice fields at Honouliuli in May to merit the term commonplace, and so may possibly be Perkins' *"Pimpla"* after all. Until found in association with the rice-borer this ichneumonid was known from the island of Hawaii only, where Mr. Swezey and Dr. Williams found it associated with an *Omiodes accepta* outbreak.

Concerning the reported occurrence of Anopheles on Oahu.—Mr. Van Zwaluwenburg noted that from time to time there is heard the report that *Anopheles* adults have been collected on Oahu by the Army authorities. This is of such real concern to the inhabitants of these islands, in view of the constant presence of malarial carriers among returned travellers, tourists, etc., that it is thought worth while to record here the facts as known. Dr. Harry L. Arnold of Honolulu, then Major, Medical Corps, United States Army, stationed on this island, states that eight or possibly nine years ago the United States Bureau of Entomology, U. S. Department of Agriculture, reported the presence of the thorax of an anopheline mosquito among the specimens submitted in a monthly sample sent in for identification from military posts on Oahu. No such finding has been reported since, although the periodic collection of mosquitoes at traps for examination by government entomologists has continued to be part of the routine of the Army Medical Corps.

Leptogenys falcigera Roger. var. *insularis* Smith.—Mr. Bryan reported an abundance of this ant at Puu Konanae, Kauai, above

the Anahola river at an elevation of about 300 ft. He exhibited a series of specimens of this insect and called attention to the little piles of pill bug and millepede remains outside the entrance to the holes in the soil leading to their nests. Mr. Bryan stated that the abundance of these ants in the locality mentioned was brought to his attention by Mr. Albert Horner, Jr.

Athesapeuta cyperi Marshall.—Dr. Williams reported that this nutgrass weevil from the Philippines has been recovered from Pioneer Mill Co. plantation, a grub being found eating into a Cyperus corm on the edge of field O.10. Evidently it was introduced in the fall of 1926 along with the nutgrass moth *Bactra truculenta* Meyr., for some time well established on Maui.

The Mexican dung beetle, Copris incertus var. *prociduus* Say. —Dr. Williams stated that this dung beetle introduced by H. T. Osborn several years ago, and that was recovered in February, 1928, back of Wailuku, Maui, had been taken in cattle droppings far up Kauaula Gulch near Lahaina on August 30.

Dr. Williams reported the liberation of the following beneficial insects:

Rhinopsis caniculatus Say.—A female of this rare ampulicid wasp was taken in the town of Webster Groves, Missouri. It was confined in a quart jar from June 12 to July 18, and during this time stored over 50 wild roaches, *Parcoblatta* females only, with short wings, in hollow elderberry stems provided for them. The progeny of this single female issued from the end of July to the end of August, and consisted of 17 females and 25 males. At least the last 8 issuances were males. Seven males and eight females were released in and about Honolulu. The wasp will attack and parasitize the small field roach, *Loboptera sakalava*, here.

Scarites beetles.—One hundred and two beetles from Webster Groves, Mo., were liberated on Oahu Sugar Co. lands in June and August.

Anaphoidea calendrae Gahan.—About 600 of these wasps were liberated at Paauhau and 40 at the Manoa Substation, H.S.P.A., Honolulu, early in August.

Mr. Van Zwaluwenburg reported that Mr. F. C. Hadden of the H. S. P. A. Experiment Station is now in Foochow, China, collecting parasites for *Chilo simplex*.

It was also announced that Mr. Muir who has been absent in England for a year, and Mr. Swezey who has been attending the International Entomological Congress at Cornell University would return to Honolulu, Sept. 12th, also that Mr. Rosa is leaving

Honolulu Sept. 6th for Japan for the purpose of bringing back living parasites of *Chilo simplex*.

OCTOBER 4, 1928

The 273rd meeting of the Hawaiian Entomological Society was called to order at 2:30 p.m. at the Experiment Station, H. S. P. A., by President E. H. Bryan, Jr. Other members attending were: Messrs. Ehrhorn, Giffard, Illingworth, Swezey, Willard, and Williams. The following visitors were present: Mr. Hubert W. Simmonds, Government Entomologist of Fiji; Mr. Bernard Trouvelot, Entomologist for the Ministry of Agriculture in Paris, France; Mr. Q. C. Chock, Board of Agriculture and Forestry.

The minutes of the 272nd meeting were read and approved as corrected.

Mr. O. H. Swezey, Editor of the Proceedings of the Hawaiian Entomological Society, reported that the Proceedings for the year 1927 had been published and distributed. Upon motion by Mr. Ehrhorn, a unanimous vote of thanks was extended to Mr. Swezey for his efficient services as Editor of the Proceedings.

The president reported that he had received a check from the Hawaiian Sugar Planters' Association to be used in payment for the printing of the Proceedings for 1927.

Upon motion by Mr. Giffard, it was unanimously voted that the secretary should notify the trustees of the Hawaiian Sugar Planters' Association that the Hawaiian Entomological Society at its 273rd meeting had unanimously passed a resolution extending the thanks of the Society for their continued interest in our work, and for their generosity in paying for the printing of our Proceedings.

Mr. H. W. Simmonds in replying to an introduction by the president said: First I wish to express my deep appreciation of the more than kind welcome which I have received on all hands since my arrival here. Turning to the subject of Entomology in Fiji, I will not touch upon any of our economic problems, but will speak about a very interesting purely scientific matter which I have come across during the course of my work in the islands.

This has to do with the widely distributed butterfly *Hypolimnas bolina* Linn. This butterfly, as you are doubtless well aware, is found from India to Easter Island, and Fanning Island in this di-

rection, whilst recently it has spread to Madagascar. Throughout this wide range the males are similar, varying only slightly in size, but the females are extremely variable, although certain forms are characteristic of certain areas. In India the female is highly mimetic and it is this form which has reached Madagascar. Nowhere, however, has the butterfly developed such a wide range of variation as in the Fijian group, although, even here, certain islands have distinctly characteristic types. The matter however of which I wish to speak is one of sex. When in the Society Islands, I found that males were apparently greatly in excess of females. I say apparently because, upon breeding, I found that the sexes were approximately equal and the apparent excess of males was brought about by a number of females somewhat approaching the males in appearance and thus escaping notice. In certain islands of the Fijian group, the sexes appear to be equal, but in others, the opposite condition to Tahiti occurs, the females seemingly to enormously exceed the males. This also applies to part of Samoa.

In order to test this and also to obtain variation data, I caught a number of wild females and induced them to oviposit in captivity. These females were mostly caught on the island of Viti Levu, one of the islands where the females so largely exceed the males. I have however obtained one all female family from the island of Vanua Levu. When my first brood emerged, to my surprise, they were all females, and this state of affairs was repeated in the whole of the 16 wild females from which I bred that year. During the two following years I was away from Fiji and unable to continue the work, but in 1926, I again took it up. At this time I was successful in obtaining two families from wild Viti Levu parents simultaneously, one of which was all females, the other mixed. From these, using the males from the mixed family, or at times wild males, I was able in one case to carry the all female family to (speaking from memory) the seventh generation without producing a single male, although males from the mixed family paired with one of their own sisters produced both sexes. Mathematically this state of affairs should lead to the extermination of the race and may possibly account for the passing of some of the powerful organisms of the past.

Mr. Swezey then asked as to the present position of the moth *Levuana iridescens* Beth.-Baker in Fiji, to which Mr. Simmonds

briefly replied that except in three small areas it had completely cleared up.

Mr. Trouvelot gave a short talk in which he outlined the tentative plans for the next International Congress of Entomologists to be held in Paris, France, in 1932.

NOTES AND EXHIBITIONS

Chilo simplex (Butl.).—Mr. Rust reported that the Board of Agriculture and Forestry had just received from Kauai, some rice straw infested with this stem borer. He stated that the straw came from Huleia, about six miles from Lihue. It was evident from discussion that followed, that this insect had only recently reached Kauai. It was noted that several entomologists have made careful surveys of rice fields on Kauai during the past several months, and had found no signs of the borer. Several theories were advanced as to how this insect had been transported from Oahu to Kauai since there is a strict quarantine on the Inter-Island movement of rice straw from Oahu.

Coptotermes formosanus Shiraki.—Mr. Ehrhorn exhibited some Ohia paving blocks from the Honolulu Iron Works store room, Queen St., showing attack by this termite. He stated that it was not generally known that termites would feed on this hard wood.

Diabrotica soror Lec.—Dr. Illingworth exhibited a specimen of this chrysomelid that he found crawling on California vegetables in a local grocery store. He stated that the waste material from this store was taken to a local piggery near vegetable gardens where this insect might easily become established. This instance shows how injurious insects may be imported in shipments of vegetables regardless of the thoroughness of plant quarantine inspection.

Eopenthes parvulus Shp.—Mr. Van Zwaluwenburg reported that Mr. E. H. Bryan on June 24 collected on the Pupukea trail at an elevationof 1400 feet, 10 adult Eopenthes on Scaevola. Of these nine are males and agree with Sharp's description of *E. marginatus;* the single female in the lot is *E. parvulus* Sharp. The finding of the two species associated together on the same host adds force to Sharp's suggestion that "*marginatus* . . . is at present a doubtful

species. It may prove to be a variety of the male of *E. parvulus*." The male of *parvulus* has never been recognized; the possibility is strong that *marginatus* is really the male of that species.

Fourth International Entomological Congress.—Mr. Swezey gave a very interesting account of the International Congress of Entomology which he had attended at Ithaca, N. Y., Aug. 12-18. He outlined the program of the meetings and mentioned some of the prominent entomologists present, both from America and foreign countries. He also described the excursions provided for those in attendance and outlined the interesting phases of some of these excursions.

Vermileo opacus (Coq.).—Mr. Swezey exhibited larvae of this dipteron of the family Lamphromyiadae collected by him in Yosemite Valley, Calif., in June, 1928. The peculiar interest in them being their habit of living in pits in dry dust similarly to the pits of antlion larvae. Dr. W. M. Wheeler had called attention to their presence in the valley, and Mr. E. O. Essig was studying them at the Museum in the Park. The pits of this dipteron were very numerous in many places in the Park, in dust beneath projecting rocks at the side of trails; dusty places at base of large tree trunks; and other dry bare places where the ground was not tramped on. Sometimes there were a few antlion pits in the same places. These were a little larger, being broader in proportion to their depth. A few small long winged flies were obtained as they were found hovering over or alighting on the dust where the pits were located, and it is presumed that they are the adults belonging to the larvae in the pits.

New Zealand Coleoptera.—Mr. Bryan exhibited a collection of New Zealand beetles received at the Bishop Museum from Mr. Albert E. Brookes, Okania, Matamata, Waikato. He read a portion of a letter from Mr. Brookes which said that a specimen of the Hawaiian weevil *Oodemas oblongum* Perk., and one or two Carpophilus had been captured in New Zealand.

NOVEMBER 1, 1928

The 274th meeting of the Hawaiian Entomological Society was held at 2:30 p. m. at the Experiment Station, H.S.P.A. President E. H. Bryan in the chair. Other members attending were:

Messrs. Chock, Ehrhorn, Fullaway, Hadden, Illingworth, Mason, Rust, Swezey, Wilder, Willard and Williams. Mr. Noel Krauss, a student at the University of Hawaii, was a visitor.

Minutes of the 273rd meeting were read and approved.

Mr. Q. C. Chock was elected as an active member.

Mr. Swezey reported that the Pan-Pacific Union was promoting the second Pan-Pacific Food Conservation Conference to be held in Honolulu, 1931.

A letter was read by Mr. Swezey from Mr. P. Van der Goot of Buitenzorg, Java, asking for information on Hawaiian insect pests and their parasites to help him in the preparation of a paper for the coming Pacific Science Congress to be held in Java, May, 1929. At the request of the president, the members agreed to send this information for groups in which they were particularly interested.

Mr. Swezey read also, a letter from H. T. Osborn which gave a very interesting account of insect pests attacking sugar cane in Porto Rico.

PAPERS

"Parthenogenesis in a Phasgonurid, Xiphidiopsis lita Hebard, in Hawaii."

BY O. H. SWEZEY

"The hosts of Cremastus hymeniae Viereck in Hawaii."

BY O. H. SWEZEY

NOTES AND EXHIBITIONS

Scolopendra subspinipes Leach.—Dr. Williams read some correspondence he had with Dr. F. Carl, Museum D'Histoire Naturelle de Geneve, Switzerland, re the identity of a series of *Scolopendra* centipedes he sent to Dr. Carl for determination, since there was a question in the minds of some of the entomologists of Hawaii as to whether there was not more than one species of the genus in our Islands. The shipment included small blue or greenish-headed specimens, large brownish mature ones, and others intermediate in size and somewhat in color. Dr. Carl's answer, of February 13, 1928, was as follows: "The lot of centipedes you sent me contains

one species only, viz.: *Scolopendra subspinipes* Leach and its young. It is a very widely distributed species, a tropical cosmopolite or nearly so. I shall send you back some specimens of the lot. *Millipeds* (*Diplopodes*) of the Hawaiian Islands, black cylindrical forms, would be very welcome for study."

Rice borers and parasites.—Mr. Hadden exhibited a Schmitt box which contained a collection of rice stem borers and parasites which he collected during his recent trip in the Orient.

Scutigerella immaculata (Newport).—Dr. Illingworth reported sending specimens of the common symphylid, which is a serious pest of pineapple roots, to Dr. H. E. Ewing, U. S. National Museum. Ewing (Sept. 18, 1928) has verified Illingworth's determination as above. This is the so-called garden centipede that gives trouble to truck crops in California, particularly asparagus in the Sacramento valley.

Metriocnemus sp. (Chironomidae).—Dr. Illingworth reported that Dr. J. M. Aldrich has identified a tiny green midge which he had bred out from water cultures. The larvae of these flies construct tubes on the walls of the dishes, reaching their heads out to feed and retracting when disturbed. In this way they resemble the much larger *Chironomus hawaiiensis* Grimshaw, the so-called blood worms in water. Dr. Aldrich says, "This genus is principally characterized by having hairs on the surface of the wings. Two specimens have been previously bred from material collected in a lily pond by Mr. Swezey.

Scenopinus lucidus Becker.—Flies collected on ripe pineapples on the Island of Lanai by Dr. Illingworth (8/30/27) have been determined as this species by Dr. Aldrich of the U. S. National Museum. He states (9/18/28) that this species was described from Egypt by Becker in Mitteil. Zool. Mus. Berlin, II, 39, 1902. And also adds, "I believe it has not been recognized from other places."

Desmometopa tarsalis Loew.—Specimens of a tiny black fly collected on a window in the laboratory, by Dr. Illingworth, were sent by him to the U. S. National Museum for determination. Dr. Aldrich, writing Sept. 18, 1928, states: "In looking up this species I came to the conclusion that the specimens sent by you some time ago and identified as *m-nigrum,* are the same and I must have erred

in the determination the other time which is the more regrettable as you say you have already published a note on these species. I have compared with European specimens of *m-nigrum* which are certainly distinct." The former specimens referred to were bred out from hen manure by Dr. Illingworth (See Proc. Haw. Ent. Soc. VI, 224).

Milichiella circularis Aldrich.—This fly is apparently a recent arrival in the islands. It was first collected near a large compost heap by Mr. Swezey, Sept. 9, 1926 (See Proc. Haw. Ent. Soc. VI, 378). Later, Dr. Illingworth collected this fly in swarms near a rubbish dump in Manoa Valley. (See same VII, 29.) Dr. Illingworth sent specimens to the U. S. National Museum for determination, June 4, 1928. Dr. Aldrich has decided that this is a new species, and has drawn up a description to be published as soon as possible.

Holochlora japonica Brunn. and *Elimaea punctifera* (Walk.)—Mr. Ehrhorn reported the abundance and severe damage done by these two locustids on hibiscus and tender mango leaves. He captured 26 adult Holochlora with a net, and out of this number six were females and 20 males. He exhibited egg-masses of *H. japonica* from which parasites (*Anastatus koebelei* Ashm.) had begun to issue. These egg-masses were found in stems of hibiscus, bougainvillea, avocado, and mango.

Megachile schauinslandi Alfken.—Mr. Ehrhorn exhibited a small rubber tube containing a nest of this bee. The cells of the nest were separated by mud partitions. From these cells several adults of this species had issued by cutting exit holes through the rubber tube.

Adrapsa manifestalis (Walk.)—Mr. Wilder exhibited a specimen of a black moth which was captured by him Oct. 28, 1928, on the glass window of his residence in Honolulu.

Megachile palmarum Perkins.—Mr. Swezey exhibited a nest of this bee made from yellow petals, probably of the golden shower tree. It was found Oct. 8th between fastened together leaflets of coconut where there had been caterpillars of the coconut leafroller. From the nest five female bees had issued. A short while previously he had reared five males from a nest in a similar situation but composed of pieces of leaves as usual.

Hippelates nigricornis Thomson.—Mr. Bryan reported the abundance of this fly on Oahu breeding in rotting vegetable material. He stated that it had been collected frequently on Oahu from 1906 to date, but apparently had not been recorded. It is recorded from Palmyra Island by Swezey, as *Hippelates* sp. in Proceedings Hawaiian Ent. Soc. III, p. 16, 1914. In the Bishop Museum Bulletin No. 31, p. 70, 1926, it is recorded by Bryan from Ocean Island, Midway Island, Lisiansky Island, and Wake Island.

DECEMBER 10, 1928

The 275th regular meeting of the Hawaiian Entomological Society was held at 2:30 p.m. at the H.S.P.A. Experiment Station. President E. H. Bryan, Jr., and other members present were: Messrs. Fullaway, Illingworth, Mason, Rosa, Rust, Swezey, Willard and Williams. Mr. J. M. Blackman, Morton H. Cassidy, Chester E. Frowe and Mrs. G. Cassidy were visitors.

The minutes of the 274th meeting were read and approved.

The treasurer's report for the year ending December 10th was read and approved subject to audit.

The following officers were elected for 1929:

President, O. H. Swezey.
Vice-President, L. A. Whitney.
Secretary-Treasurer, H. F. Willard.
Executive Committee, Dr. J. F. Illingworth, W. M. Giffard.

Presidential Address

BY E. H. BRYAN, JR.

PAPERS

"On a new Genus, with two new Species of Hawaiian Cerambycidae. (Col.)

BY DR. R. C. L. PERKINS.

(Title submitted by O. H. Swezey.)

"Notes on the Egg-parasites of Insects in Hawaii."

BY O. H. SWEZEY

"Further Notes on the Insects of Molokai."

BY O. H. SWEZEY AND E. H. BRYAN, JR.

NOTES AND EXHIBITIONS.

Acrodrepanis megalopylla (Meyr.).—Mr. Swezey exhibited a specimen of the male of this species, which had been collected by a friend of a student of the University of Hawaii at Kaumana near Hilo. There are no specimens of the male of this species in any collections in Honolulu, and this is the first specimen seen by any of the present entomologists in Hawaii.

Two new immigrant flies.—Mr. Swezey exhibited specimens of two species of flies not previously known here. They were collected by sweeping in rice fields in the Pearl Harbor district of Oahu. He was unable to determine them, but apparently one of them was a species of Ortalis.

Telenomus nawai Ashm.—Mr. Swezey reported having found four egg clusters of *Spodoptera mauritia* (Boisd.) on leaves of a small Ficus tree at the Kamehameha School grounds Nov. 8, 1928. Two of the egg clusters were parasitized by Telenomus as indicated by their appearance. The other two were collected and kept in a vial. On Nov. 11, caterpillars hatched from one egg cluster; and on Nov. 21, Telenomus issued from the other egg cluster. As three of the four egg clusters were parasitized, and 100% parasitized in each cluster, while the cluster from which caterpillars hatched had none that were parasitized, the actual parasitization was 75%.

Hymenoptera from China.—Dr. Williams reported that the following Hymenoptera from material collected by F. C. Hadden in China had been identified by Cushman of the U. S. National Museum as follows:

Sp. A—*Amyosoma chilonis* Vier.
Sp. D—*Centeterus alternecoloratus* (n. sp.) Cushman.
Sp. E—*Chelonus chilonis* (n. sp.) Cushman.
Sp. X—*Dioctes chilonis* (n. sp.) Cushman.

These are parasites of the *Chilo* rice borer, and a number of Sp. A (Braconidae) and Sp. X (Ichneumonidae) were liberated in

a rice field near Pearl City. The paper by Cushman describing these three new species received for publication.

Copris incertus var. *prociduus* Say.—Dr. Williams reported that a beetle collected in Mexico by H. T. Osborn had been identified as this species by Fisher of the U. S. National Museum. This beetle is established on the Island of Maui and helps destroy the breeding places of the hornfly.

Erebus odora (L.).—Mr. Bryan noted that this moth known as the Black Witch had been observed in Hawaii as follows:

Kona, Hawaii, Honaunau, October 15th, 1928. (Mason).
Manoa, Oahu, Parker St., November 7th (Krauss).
Woodlawn, Manoa, November 8th. (Williams).
Punahou, November ? (Mrs. Greenwell).
Nuuanu, November 14th. (Waldron).
Manoa. (Ehrhorn).

These observations indicate that this moth is a new immigrant that has become established here, especially as some of the specimens collected were in perfect condition as though they had but recently emerged.

Annual Address

BY E. H. BRYAN, JR.

(Presented at the meeting of December 10, 1928)

This meeting celebrates the twenty-fourth anniversary of the founding of our entomological society. Twenty-two of my predecessors have presented annual addresses. These have varied greatly in subject. The majority have been papers of a systematic nature: descriptions of new species, lists of insects from various regions, or life-history notes. A few have been on economic problems. Two have been ecological discussions; two philosophical dissertations; and two summaries of past work in entomology.

I am unable to give you a systematic paper; my recent work has led me far afield from taxonomy and systematic study in entomology. Neither am I philosophically inclined. You have all heard enough about the past. What I propose to do for a few minutes this afternoon is rather to glance into the future; to try to point out one of Hawaii's greatest entomological needs, and how I believe this society can remedy that need.

A fortunate sequence of events has placed Hawaiian entomology on a very high level. The insect fauna of few regions is better known, and our work on the biological control of insect pests is a classic example. The series of events which has brought this about begins with the Rev. Thomas Blackburn, who may well be called the "Father of Hawaiian entomology." His enthusiastic collecting during a six year residence in these islands awakened the interest of European entomologists in the unique features of our insect fauna. This resulted in the extensive systematic collecting by Dr. R. C. L. Perkins. His collecting not only made possible the publishing of the "Fauna Hawaiiensis," but his presence in the islands at the time of the sugar cane leafhopper outbreak did much to bring about the control of that pest by introducing natural enemies. The successful control of this and other insect pests in Hawaii demonstrated the value of economic entomology, and led to the establishing of our large, well equipped laboratories, manned by capable entomologists. Finally, the presence of such a group of trained entomologists in the Territory, and their organization into this society, has greatly increased the knowledge of our insect

fauna. With the printing of this year's Proceedings, this society will have published about three thousand pages of notes and papers on Hawaiian and other Pacific insects. Collections of insects and technical data are therefore not Hawaii's greatest need in entomology, although much remains to be done in both these lines.

The same may be said of economic entomology. One after another the insects pests of Hawaii have been brought under control, and a group of experts stand ready to combat any which may appear. The sugar cane leafhopper, sugar cane beetle borer, anomala beetle, armyworms, mealybugs, scale insects, leafrollers are all controlled by natural enemies. Even the fruit flies have been greatly reduced in number. The rice borer appears in our fields, and at once measures are taken to combat it. Termites attack our houses and poles, and a strenuous campaign is waged against them. Our ports are guarded against a constant bombardment of pests, by efficient quarantine service. No, there is no deficiency in this field of entomology in Hawaii, although we should continue to give it our full support. What then do we lack?

Our great need is for comprehensive and readily accessible general information about Hawaiian insects, which can be understood by those not trained in entomology. I find this need on all sides: among scientifically inclined visitors, amateur collectors, teachers in our schools, students of all grades, our boys and girls. How can we expect people to take an interest in our insect life, if there is no simple source of information from which they can learn about it? Where will we get our entomologists of tomorrow? No doubt from elsewhere, as in the past. But why not from Hawaii! Despite all their training in "nature study," the students who enter my classes at the University of Hawaii scarcely know what an insect is. And what else can you expect when the average teacher in the schools knows so little about our insect life, and has such scanty understandable source of information about it? At the Museum I am frequently asked, "Haven't you any book about Hawaiian insects?" Why not make available for these various groups the information they desire? That is what I consider our greatest entomological need in Hawaii.

You will recall what Professor Needham said when he spoke before this society last summer, on his way home from a short stay in China. He said in substance, "Yes, my teaching experiences in

China were successful. But I think my best contribution out there will be one I wasn't paid for. I collected all the species of dragonflies I could find, and I am going to write them an illustrated handbook on the dragonflies of China. What they need most is information about their insect life."

Professor Tillyard's greatest contribution to entomology is his "Insects of Australia and New Zealand." Think how many future entomologists in that vast region will have gotten their start from that splendid book. In like manner, the greatest contribution of Professor Essig is his "Insects of Western North America;" of Dr. Britton, his series of guides to the insects of Connecticut; of our beloved Professor Comstock, his monumental "Introduction to Entomology."

Why cannot this society produce a similar account of the Hawaiian insects? There is no dearth of data. Some of us can almost produce sections of it from our heads, with very little research. In this connection let me commend the splendid papers by Dr. Williams on the bees and wasps of Hawaii, and the Kamehameha butterfly. It is this type of contributions that we need. In a rash moment of enthusiasm I outlined a book on the Hawaiian insects and actually wrote two chapters. But the more I wrote the more inadequate I felt to produce such a book. To write a really accurate, authentic and yet readable handbook, one must be thoroughly familiar with every detail of the subject. Then the idea occurred to me, why not make this a cooperative undertaking, each one of the entomologists to write on the group with which he is most familiar. It is that proposition that I submit to you at this time.

What could be more fitting than that we should celebrate the twenty-fifth anniversary of this society, next year, with the publication of an "Introduction to the Hawaiian Insects"? No one of us, because of the press of our other duties, could undertake the task alone. But working together we could do it easily. Much of the work would be simply compilation. One of us, I am sure, could find time to do the editing. The publication of such a book would be simple enough. Similar books have been or are being written on our trees, weeds, and coral reef life, and their publication is certain. I have already been assured that a book on Hawaiian insects can be published as soon as written. Will you all cooperate with me in this undertaking?

Three New Ichneumonoid Parasites of the Rice-borer (Chilo simplex (Butler)).

BY R. A. CUSHMAN,

Bureau of Entomology, U. S. Department of Agriculture.

(Presented by F. X. Williams at the meeting of December 10, 1928)

The specimens from which the following three new species are described were received from the Hawaiian Sugar Planters' Association through Dr. F. X. Williams.

Centeterus alternecoloratus new species.

Female.—Length 10 mm.; antennae 4 mm.

Head with coarse separated punctures throughout, densest on face and frons; occiput very deeply concave; temples convex, their cephalo-caudad width about equal to that of eye; eyes parallel within, about as long as width of face; combined face and clypeus hardly twice as broad as long, face medially slightly elevated, clypeus apically inflexed and medially bidentate; malar space very short; mandibles large, of nearly equal width throughout, upper tooth much larger than lower; antennae subclavate, first three joints of flagellum subequal, the first very slightly the shortest. Thorax slightly depressed, about twice as long as broad, with rather coarse separated punctures, densest on metapleurum; notauli practically wanting; scutellum flat; propodeum more coarsely and densely punctate and more or less rugose, petiolar area transversely rugose, barely as long as areola; wings short, barely reaching to apex of third tergite; legs rather short, hind femur not reaching apex of second tergite. Abdomen narrow lanceolate, densely and coarsely punctate, postpetiole and base of second tergite longitudinally rugose; gastrocoeli small, very shallow, removed from base; ovipositor slightly exserted.

Alternately black and ferruginous, the head, propodeum and metathorax, and abdomen beyond fourth tergite, being black, the last with bluish reflections; antennae basally red, blackish beyond fourth flagellar joint with a poorly defined pale annulus centering on the ninth joint; mandibles and more or less of clypeus piceous red; palpi reddish stramineous; front legs entirely and others basally ferruginous; middle of femur except basal third, tibia at apex, and tarsal joints more or less blackish or fuscous; hind femur except at extreme base blue black; tibia fuscous, tarsus fuscous with bases of joints pale; wings hyaline, venation dark brown, radices and tegulae red.

Male.—Even more slender than the female with antennae longer and more slender, tapering toward apex, entirely red; middle legs practically entirely red, the coxae and trochanters, as also those of front legs, almost stramineous, hind legs dark only at apices of joints; propodeum reddish at apex; first five tergites red.

Type-locality.—Foochow, China.

Type.—Cat. No. 41639, U.S.N.M.

Three females and four males reared by F. C. Hadden.

There is some variation toward smaller size in both sexes, and some of the males have the face more or less reddish. The bluish reflection of the apex of the abdomen is usually absent in the male though present in the allotype.

Dioctes chilonis new species.

Female.—Length 8 mm.; antennae 6.5 mm.

A slender species.

Head thin, temples sharply narrowed, flat; ocellar diameter slightly shorter than ocell-ocular line; frons and face densely punctate, opaque; vertex and temples more sparsely punctate; eyes parallel, slightly concave opposite antennae; combined face and clypeus a little broader than long, clypeus very broadly rounded, almost truncate; malar space two-thirds basal width of mandible; antennae slender, slightly thicker in middle. Thorax densely punctate opaque with only the speculum polished; propodeum behind basal carina rugose, petiolar area transversely so; areola longer than broad, separated from petiolar area; legs slender; hind basitarsus nearly as long as other joints combined; longer hind calcarium reaching beyond middle of basitarsus; stigma and radial cell narrow; intercubitus fully twice as long as second abscissa of cubitus; nervulus postfurcal; nervellus strongly curved but not broken. Abdomen slender; first tergite polished, only the sides of postpetiole very faintly alutaceous; second tergite longer than broad at apex, spiracles slightly beyond middle, gastrocoeli distinct, shallow, nearly circular, removed from base by about their diameter; ovipositor about as long as first two tergites combined.

Black; only the second tergite slightly tinged with yellowish toward apex; scape and pedicel below and mandibles reddish; palpi pale; legs largely red, middle and hind coxae largely or entirely black; front and middle trochanters and distal joint of hind trochanter and all calcaria stramineous; apex of hind tibia infuscate; wings hyaline, venation dark brown, radices and tegulae whitish.

Male.—Essentially like female.

Type-locality.—Foochow, China.

Type.—Cat. No. 41640, U.S.N.M.

Two females and three males reared by F. C. Hadden.

Chelonus chilonis new species.

In Extra Report No. 18 of the Nagasaki Agricultural Experiment Station, 1917, T. Kondo records among other parasites of *Chilo simplex* four species ascribed to Matsumura. I have been unable to find descriptions of any of the four and am forced to the conclusion that they are *nomina nuda*. One of the four is *Chelo-*

nus munakatae Matsumura. It seems very probable that it was proposed to apply this name to the present species.

Female.—Length 7 mm.; antennae 5 mm.

Head broad behind eyes, temples strongly convex and distinctly broader than the short diameter of eye; head throughout rugose, more striately so on vertex and temples, more reticulately so on face and frons; clypeus densely punctate, with a slight median truncate production apically; face about one and two-thirds times as broad as length of eye; malar space nearly two-thirds as long as eye; antennae slender, slightly broadened and flattened below beyond middle, flagellum 33-jointed, first joint much shorter than scape but nearly a half longer than second joint, other joints gradually successively shorter. Thorax and propodeum very coarsely rugose, the interspaces foveolate; notauli broadly impressed and foveolate; prescutum anteriorly comparatively smooth with a median foveolate impression; lateral areas of scutellum longitudinally rugose with a broad polished margin; propodeum with irregularly defined, roundly triangular areola and apical carina, the latter dentate at sides, the apical area nearly perpendicular; legs slender, the hind femur abruptly thinner toward base; wings reaching slightly beyond apex of abdomen; stigma narrow and distinctly longer than radial cell on metacarpus; apical abscissa of radius straight; subdiscoideus curved but not especially strongly so; nervellus strongly curved. Abdomen as long as combined length of head and thorax and nearly two and one-half times as long as broad, coarsely reticulate rugose basally, indistinctly so apically, some of the rugae basally, especially between the basal carinae, longitudinal; ventral opening extending to within a short distance of the apex.

Black with a broad, medially interrupted, subbasal white band on abdomen; mandible reddish piceous; palpi black at base, fuscous beyond second joint; wings subhyaline basally, rather deeply infuscate apically, tegulae and radices piceous; legs black; front femur at apex, tibia and tarsus reddish; middle and hind tibiae with subbasal white annulus, their tarsi fuscous with basitarsus white except at apex, calcaria white.

Male.—Very like female except that the antennae are very nearly as long as the body, and not at all thickened beyond middle; and the abdomen is entirely black.

Type-locality.—Foochow, China.

Type.—Cat. No. 41641, U.S.N.M.

Two females and four males reared by F. C. Hadden at the type-locality and two males from Japan reared by S. I. Kuwana from the type-host.

Engytatus geniculatus Reuter—an Important Pest of Tomatoes in Hawaii (Hem.)

BY J. F. ILLINGWORTH

(Presented at the meeting of April 5, 1928.)

During my recent trip to Hawaii, Japanese gardeners called my attention to the fact that many of their tomatoes failed to set fruit. I found the vines growing in a very thrifty condition, and though there were many flowers there were few fruits developing.

Sweeping with the insect net over the vines I collected many small mirid bugs. I then found that these insects were closely associated with the blossoms. Placing the cyanide tube over individual flowers I saw that I could in this way collect great numbers of the bugs. Further examination showed that they were a real pest, sucking the juice from the developing ovaries, and thus causing the falling of the blossoms prematurely. Hence the result was that little or no fruit was setting on the vines.

I find that this bug was first reported by Swezey, who collected it on tomato vines in Manoa Valley, August 13, 1924 (See P.H.E.S. VI, 18). E. P. Van Duzee determined this species for Swezey (See P.H.E.S. VI, 230), stating that it occurred from Florida to Texas and through Arizona to Southern California. Also in Sonora and Lower California. Later Swezey collected this bug at Kahuku (See P.H.E.S. VI, 237) and at Kailua, as well as at Ewa Plantation Company (See P.H.E.S. VI, 240). November 4, 1926, Mr. Swezey collected this little bug on tomato-vines on Maui, which is the first record of its occurrence on that Island.

I find that this bug, and a closely related species, *E. notatus* Dist., are very injurious to tobacco in Brazil (See Rev. Appl. Ent. Ser. A. XII, 66). That paper states that "the eggs are laid in the median nerve of the lower surface of the leaf; they hatch in 7 days, and the adults appear 9 days later. The life of the adults is about 9 days. The generations follow each other uninterruptedly. As a result of attack the leaves become yellow and dry prematurely; as the capsids fly from plant to plant they may also transmit various diseases of the tobacco plant."

I have not noticed any injury from the bugs on the leaves of

tomato plants, and we have no record of this mirid as a pest of tobacco in Hawaii. It certainly is a pest to be on the lookout for, if one is attempting to grow the latter crop.

Such a pest should not be hard to control with our miscible oil or emulsion sprays. In a rainy section several applications will probably be necessary.

Preliminary Notes on Pests of Agricultural Crops of Kona, March 15, 1928.

BY J. F. ILLINGWORTH

(Presented at the meeting of April 5, 1928.)

Coffee

1. Green scale (*Coccus viridis* Green) produces the so-called coffee-blight, a black smut forming on leaves and cherries. This is a fungus growing on the honeydew excreted by the scale insects. The history of this pest in Hawaii is interesting, starting about 1905 (see Hawaiian Forester II, 397). The scale was first noticed on lemon trees, and probably came from Fiji. It destroyed the coffee industry of Ceylon in the course of 10-20 years. *Natural enemies* are very prolific, holding this pest well in check under favorable climatic conditions. With the constant showers, at this season, the fungus introduced from Florida is very effective, killing the scale and growing out a short fringe from the borders. The chalcid enemies (*Prococcophagus orientalis* Howard, and Encyrtus sp.) appear to be abundant. The predaceous lady bird beetles (*Orcus chalybeus* Boisd. from Australia and *Chilocorus circumdatus* Shön. from China in 1895) are doing good work.
2. Mealy bugs (*Pseudococcus brevipes* Cockerell) are also present in the axils of the leaves and on twigs. These are well under control. I noticed lady bird beetles (*Lindorus* [*Rhizobius*] *ventralis* Erich. and *Cryptolaemus montrouzieri* Mulsant) everywhere present. These were both introduced from Australia via California in 1894.
3. Mites of very tiny size are abundant on the under sides of the leaves. The white spots composed of their empty cast skins are very noticeable even to the naked eye.

4. Mediterranean fruit fly (*Ceratitis capitata* Wied.) appears to be held well in check by natural enemies. *Diachasma tryoni* Cameron, introduced from Australia in 1913, was bred out in considerable numbers, from the maggots.
5. Plant lice (*Toxoptera aurantiae* Koch.) appear to be held well in check by natural enemies. I noted Syrphids (*Allograpta obliqua* Say), the maggots feeding upon the adult plant lice; the green lacewing fly (*Chrysopa microphya* McL.) was also present, and lady bird beetles (*Platyomus lividigaster* Muls. and *Coccinella inequalis* Fab.) both introduced from Australia, 1894.

Minor Pests of Coffee.

Grasshoppers (*Elimaea punctifera* Walk. and *Conocephalus saltator* Sauss.), springtails on leaves at the higher levels, above the road. Scavenger caterpillars (*Ereunetis simulans* Butl.) infest the places where the old branches have been badly pruned; they cover the dead wood of the wounds with their webs, which accumulate litter. They appear to be preyed upon by small ichneumons. Tree rats do considerable damage, breaking over the ends of branches, the dead leaves of which make the orchards unsightly.

Cotton

1. Pink bollworm (*Pectinophora gossypiella* Saund.) is by far the most serious pest. It is preyed upon by a number of different wasps. Willard (U.S.D.A. Tech. Bull. No. 19, Nov., 1927) records seven. I secured the braconid, *Chelonus blackburni* Cam., the ichneumon, *Ephialtes* (*Pimpla*) *hawaiiensis* Cam., and the chalcid, *Chalcis obscurata* Walk.
2. Black scale (*Saissetia nigra* Nietn.) is fairly well controlled by fungus and other natural enemies.
3. Mealy bugs (*Pseudococcus filamentosus* Cockerell, and *Pseudoccus brevipes* Cockerell) are now little in evidence, being well controlled by natural enemies. I observed everywhere numerous lady bird beetles, belonging to two species, *Lindorus* (*Rhizobius*) *ventralis* Erich, and *Cryptolaemus montrouzieri* Muls. both introduced from Australia via California in 1894.
4. Plant lice (*Aphis gossypii* Glover) are parasitized by *Lysiphlebius* sp. introduced from California (See Proc. Haw. Ent. Soc. V. 345).

5. Budmoth (*Batrachedra rileyi* Walsm.) bred out abundantly from the diseased bolls. These are preyed upon by various wasps to feed their young. I observed *Polistes aurifer* Sauss., *Polistes hebraeus* Fab., and *Pachodynerus simplicicornis* Sauss. collecting such caterpillars. The latter wasp, I find, is a rather recent (1911) emigrant from America.

Minor Pests of Cotton.

Scarabaeid beetle (*Adoretus sinicus* Burm.). These beetles eat more or less of the foliage, but the most damage to the cotton plant is done by the grubs, feeding on the roots. Large grasshoppers (*Elimaea punctifera* Walk.) also feed on the foliage to some extent. These are preyed upon by minah birds. Mites, with the appearance of red spiders (*Tetranychus* sp.) do not do much damage; they were only found in a couple of places. Thrips (*Euthrips hawaiiensis* Morgan) are not abundant, though generally distributed. (See Proc. U. S. Nat. Mus. 46, 3. Also Proc. Haw. Ent. Soc. III, 60). There is also a small anthribid beetle (*Araecerus fasciculatus* DeG.) found in and about the bolls. These gnaw slightly among the bracts of the seed pod.

Tomato

1. Fruit worm (*Heliothis obsoleta* Fab.) is not very troublesome. I collected some of the caterpillars and the moths came to the trap-lanterns at night. The tachinid fly (*Archytas cirphis* Curran) introduced from Mexico by Osborn, is now abundant at Kona.
2. Mirid bug (*Engytatus geniculatus* Reut.) is a most serious pest of tomatoes, sucking the blossoms so that the fruit will not set. The flowers fall soon after opening.
3. Melon fly (*Chaetodacus cucurbitae* Coq.) does little damage. It is well parasitized by *Opius fletcheri* Silv. imported from India.
4. Slugs damage fruit that rests on the ground and the injured portion soon rots.

Cucumber

1. Melon fly (*Chaetodacus cucurbitae* Coq.) is still the worst pest. The growers trap many of the eggs by exposing split cucumbers on which the flies oviposit. These sections are then destroyed before the maggots escape.

2. Plant lice (*Aphis gossypii* Glover) is a general feeder, doing considerable damage to cucumber leaves and vines. Several natural enemies hold them in check. I observed the valuable work of a syrphid (*Allograpta obliqua* Say) and two kinds of lady bird beetles (*Platyomus lividigaster* Muls. and *Coccinella inequalis* Fab.).

Cabbage

1. Cutworms were reported troublesome on the young plants. These are probably controlled by the tachinid (*Archytas cirphis* Curran) now well established.
2. Diamond-backed cabbage moth (*Plutella maculipennis* Curt.) is a serious pest. It is well parasitized by an ichneumon (*Limnerium polynesiale* Cam.).
3. Cabbage louse (*Brevicoryne brassicae* L.) is very abundant in old patches. Many of the dried skins have circular holes in them where parasites have emerged. I bred out a number of tiny braconids.
4. Serpentine leafminer (*Agromyza pusilla* Meig.) is abundant and does considerable damage to the leaves.
5. Cabbage butterfly (*Pontia rapae* Linn.) is very abundant and destructive. A chalcid (*Chalcis obscurata* Walk.) emerged from a pupa of this butterfly collected.
6. Thrips, though abundant, do not appear to do any serious damage to the plant.

Beet and Spinach.

1. Beet web-worm (*Hymenia recurvalis* Fab.) caterpillars skeletonize the leaves. The moths were plentiful in weed patches near the gardens.
2. Plant lice (*Aphis gossypii* Glover) were sufficiently abundant to cause the leaves to dry down, producing a sickly appearance. The natural enemies are the same here as I have listed with cucumbers.

Citrus.

1. Green scale (*Coccus viridis* Green) is troublesome on orange trees located alongside coffee trees infested with this pest. The natural enemies I have listed under coffee.
2. Mediterranean fruit fly (*Ceratitis capitata* Wied.) does very little damage to citrus in Kona. This pest appears to be well

checked by natural enemies (See under coffee.). The best reference is U. S. Dept. Agr. Bull. 536, 1918.

3. Orange rust mite (*Phyllocoptes oleivorus* Ashm.) is also known as the silver mite of lemon. It occurs on both leaves and fruit.
4. Fuller's rose beetles (*Pantomorus godmani* Crotch) congregate among the leaves on the twigs; the larvae are found in the soil feeding on the root tips.

Papaya.

1. Green syrphid fly (*Volucella obesa* Fab.). Masses of eggs are laid on bark of older plants. The newly hatched maggots work their way into the stem, and cause a considerable flow of the milky sap.
2. Soldier fly (*Neoexaireta spinigera* Wied.) lays eggs in wounds caused by No. 1. Natural enemies, destroying the maggots of both the above species, are plentiful. I collected and bred out staphylinid (*Philonthus discoideus* Grav.) and hydrophilid beetles (*Dactylosternum abdominale* Fab.). Both the young and adults of these predaceous species were seen feeding upon the eggs and maggots of the flies.
3. The oriental blowfly (*Chrysomyia megacephala* Fab.) swarmed about the decomposing sap of the wounds, on which it feeds. I could find no indication of breeding in the putrid mass.

Macadamia Nut.

1. Leafroller (*Amorbia emigratella* Busck) is rather plentiful on young trees. The eggs are laid on the upper surface of the leaves. The clusters are coated over to protect them from the weather. Egg parasites are evidently doing effective work, from the exit holes I saw in some of the shells. The caterpillars also are preyed upon by several natural enemies. I saw a locust (*Xiphidiopsis liti* Hebard) pulling one out of its leaf-fold. Ants (*Pheidole megacephala* Fab.), too, are destructive to the larvae. Various wasps were also noted, searching among the foliage, particularly the predaceous *Pachodynerus simplicicornis* Sauss. An ichueumon (*Ephialtes hawaiiensis* Cam.) was seen in abundance. Swezey has recorded it as a parasite of this leafroller. (See Ent. Bull. 5, Exp. Sta. H.S.P.A. p. 43, 1907).

Mango.

There was no fruit on the trees at the season I was in Kona. The foliage appears to be remarkably free from pests.

Avocado.

The leaves and fruit are clean and bright. There was none of the mealy bug (*Pseudococcus nipae* Mask.) in evidence.

Banana.

There was little evidence of pests present. A few of the leaves showed the work of the rose beetle (*Adoretus sinicus* Burm.). The bunches were clean.

Pineapple.

1. The mealy bug (*Pseudococcus brevipes* Cock.) was the only pest in evidence on the wild variety. The plants appeared to be very thrifty with no signs of "Wilt."

Lantana.

1. Seedfly (*Agromyza lantanae* Frogg.) is the most effective check upon the spread of this pestiferous weed in the humid Kona district.
2. Plume moth (*Platyptilia pusillidactyla* Walk.) plentiful around the flower clusters.
3. Lantana leafbug (*Teleonemia lantanae* Dist.) is an effective check only in the dry region far below the main road.
4. Lantana butterfly (*Thecla bazochii* God.) was rather plentiful about the blossoms.
5. Gall fly (*Eutreta xanthochaeta* Ald.) is everywhere in evidence, and the galls are plentiful, yet it does little to check the growth.
6. Leaf miner (*Cremastobombycia lantanella* Busck) is not abundant enough to cause much distress to the foliage.
7. Lantana blight (*Orthezia insignis* Doug.) is effective only in the dry region near the coast. Though specimens were observed in the humid belt along the main road, it does not thrive there enough to do any good.

Guava.

1. Black scale (*Saissetia nigra* Nietn.) is found on scattered plants, but does little good in checking growth. It is preyed on

by fungus. No mealy bug (*Pseudococcus nipae* Mask.) was observed. The humid climate of the Kona district, along the main road is perfect for the growth of this plant, and it is practically free from natural enemies. Even the fruit showed little infestation from fruit fly (*Ceratitis capitata* Wied.).

Pests of Pineapple in Hawaii

J. F. ILLINGWORTH

(Presented at the meeting of May 3, 1928)

A. Affecting the root system:

1. Snails (*Caecilioides baldwini* Ancey) feed on the root tips —favor moist location, not widely distributed.

2. Symphylids (*Scutigerella immaculata* Newport.). Very similar in habits and distribution to the above. Very destructive to root tips wherever they occur.

3. Mycetophilidae (*Sciara molokaiensis* Grimshaw). Periodic in occurrence, following wet weather; larvae gnaw tender young root tips during periods of drought.

4. Collembola. Numerous species occur in pineapple soils,—a slender white form in great numbers. These gnaw pits in living roots during dry spells.

5. Mites. (*Rhizoglyphus phylloxerae* Riley). Very destructive in a few localities.

6. Mealy bugs (*Pseudococcus brevipes* Cockerell) congregate on young roots in fields poorly prepared.

7. Nematodes—several species, very destructive.

Minor pests: Pauropodidae, *Japyx* sp., sowbugs, pillbugs, burrowing cockroaches (*Pycnoscelus surinamensis* Linnaeus), scarabaeid grubs (*Adoretus sinicus* Burmeister), Fuller's rose beetle (*Pantomorus godmani* Crotch), several species of tiny centipedes, etc.

B. Affecting the fruit, stem and leaves:

1. Mealy bug (*Pseudococcus brevipes* Cockerell).

2. Scale (*Diaspis bromeliae* Kerner).

Both the mealy bug and scale congregate on plants that are fail-

ing from other causes. The former are sometimes troublesome on fruits. Both are held pretty well in check by natural enemies.

3. Budmoth (*Batrachedra rileyi* Walsingham). The tiny pink caterpillars of this species are particularly troublesome on the fruits. They live in the withered flowers and outer calyx cavities and frequently gnaw the leaves of the crown. Rot organisms enter through the wounds, causing the breaking down of the fruit. (See Pineapple News, July, 1927, pp. 67-71.) The webs of the larvae collect all sorts of litter, giving the fruit a bad appearance. This pest is pretty well controlled by predacious wasps and beetles, collecting the caterpillars for food.

4. Souring beetles (Nitidulidae). There are about five exotic species found in pineapple fields. The one most troublesome and abundant is *Carpophilus humeralis* Fabricius. These beetles are pests of the plant at every stage of its growth. Starting when the planting material is put into the soil, they congregate on the butts, gnawing out the starchy material between the fibers, they oviposit there and the developing grubs frequently cause the breaking down of the plant, by feeding at the base of the lower leaves, where rot-fungi are introduced. When abundant, they gnaw cracks between the lower eyes of the fruit, followed by fermentation.

5. Midges (Chironomidae). The larvae of a tiny gnat (*Apelma brevis* Johannsen) are always present in the water-pockets between the leaves of growing pineapple plants. These normally feed upon the accumulations of wind-borne trash that collects there, but occasionally they rasp the very tender white tissue at the base of the new leaves, permitting the entrance of rot-organisms.

6. Pineapple mite or red spider (*Stigmaeus floridanus* Banks). These mites are now widely distributed in our pineapple fields, but for some reason they have never become a serious pest. They are frequently seen when stripping planting material, congregated between the lower leaves. They cause a drying out of definite spots where the colonies are located, but apparently disappear as the plant begins to develop.

Minor Pests: Grasshoppers (*Oxya chinensis* (Thunb.) and *Atractomorpha ambigua* Bolivar), Crickets (*Gryllus oceanicus* Le Guillon), flies (*Atherigona excisa* Wied., *Euxesta annonae* Fab.,

and *Drosophila repleta* Woll.). Ants attending mealybugs (*Pheidole megacephala* Fabr.) and ground beetles (Tenebrionidae).

Grasshoppers Eat Pineapple Mealy Bugs and Other Pests

BY J. F. ILLINGWORTH

(Presented at the meeting of July 5, 1928)

On June 20 while collecting mealy bug material at Waipio, for experimentation in the laboratory, I noticed that most of these pests had disappeared. A few weeks before the small fruits in a wilting section of the field were thickly plastered with mealy bugs, hence I was interested to know what had become of them.

The field had become very weedy, and I noticed great numbers of our small, green, longhorned grasshopper (*Conocephalus saltator* Sauss.) especially about the plants. Swezey (Bul. 1, part 7, pp. 212-214, Div. Ent., Exp. Sta. H. S. P. A., Dec., 1905) reported this locust as largely predaceous upon the sugar cane leaf hopper, during his investigation of that pest. He found that it also fed sparingly upon the flowers of lantana and canna, and that it liked the leaves of honohono, but seldom touched sugar cane. In September, 1926, I first observed these hoppers feeding upon pineapple mealy bugs.

June 22, 1928, six of the half grown hoppers were collected in the field, and placed in separate glass tubes, to test out their feeding habits. Each was supplied with twenty mealy bugs, and flowers of pigeon pea and alfalfa. The bugs were soon devoured, and there was only slight nibbling at the blossoms. A fresh supply of mealy bugs was put into each tube whenever the old ones were eaten. I kept them in this way for one week, when the total numbers of mealy bugs devoured were 110, 95, 90, 80, 70, and 50.

The young grasshoppers also showed a decided liking for both the caterpillars and pupae of our various bud moths, pests so troublesome on the young fruit. Furthermore there appeared to be no desire to eat the pineapple foliage, though the fresh blossoms were nibbled slightly.

I do not think there is any question but that these hoppers were

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the principal agent in clearing out the mealy bugs. They certainly are valuable predators to have in our fields.

As a matter of fact, however, they do not thrive in our good fields, and we seldom see them. It is only when the place is practically abandoned, and growing up to weeds, with multiplying insect pests, that these grasshoppers congregate. At any rate, they do much to rid us of some of our most troublesome pests—nipping them in the bud, so to speak. Without such friends, helping to keep the balance of nature, the growing of crops would soon become impossible.

Parallelisms Between the Insect Fauna of Hawaii and that of Samoa

BY F. MUIR

(Presented by O. H. Swezey at the meeting of March 1, 1928)

The publication of "Insects of Samoa" by the British Museum (Natural History) is of interest to entomologists in Hawaii. As each part appears, entomologists can compare this insect fauna in the south Pacific with that of Hawaii. This comparison reveals some interesting parallelisms and leads to some interesting conclusions. Taking the part by G. J. Arrow on the Clavicornia and Lamellicornia (Pt. IV, Fasc. 1, pp. 35-66) we find him making certain remarks that have already been made about the Hawaiian Lamellicornia. In Samoa, as in Hawaii, the only native representatives of the great group Lamellicornia are a few species of Lucanidae, the Scarabaeidae being only represented by seven species, all evidently of recent introduction. In commenting upon these immigrants he says, "The, in several cases, too successful establishment of those immigrants, which have become serious pests, shows that there are no local conditions inimical to their kind to account for the deficiency. The explanation is probably to be found in that fact that while the Lucanidae pass their early stages in rotting wood, the scarabaeid Lamellicornia nearly all do so underground, so that the ocean, which may have brought the former in drifting logs from other shores, formed an impassable barrier to the latter, until surmounted by human agencies." This is practically what has been remarked about the absence of this large group from Hawaii.

The Clavicornia consists of fifty-seven species, mostly small and mostly species breeding in rotting wood. Among them there are twelve species so far only known from Samoa, five species known only from Hawaii and Samoa, twenty-eight species of wide distribution and six species known from near-by islands. Thus nearly fifty per cent are such that have the power of being carried over large ocean areas and so have become world-wide. While much more work is still to be done in Samoa before we can make a final judgment, yet I believe we will not be far wrong if we conclude as follows:

(*a*) The Samoan Islands are oceanic and have never been connected to any other large land area, not even to the Fijian Islands.

(*b*) The amount of endemism does not justify us in regarding the islands as of very great antiquity, not near so great as Hawaii. The small amount of island endemism also leads to this same conclusion.

(*c*) The similarity between the Hawaiian and Samoan insect fauna does not indicate any connection between these two archipelagoes, but to similar means of being populated owing to similar conditions of isolation.

The study of the Fulgoroidea also leads to similar conclusions. So far there is nothing that we can regard as a "Polynesian" insect fauna in Samoa, but perhaps this may be revealed when we have fuller knowledge of the insect fauna of the islands more to the east and southeast.

On a New Genus, With Two New Species, of Hawaiian Cerambycidae. (Col.)

BY DR. R. C. L. PERKINS

(Presented by title by O .H. Swezey at the meeting of Dec. 10, 1928)

Aeschrithmysus new genus.

The generic name Aeschrithmysus is here proposed to include two undescribed species of the Plagithmysus group, these species marking the extreme development in one direction from Plagithmysus itself. They are of large size and somber colour, and devoid of any ornamentation or pattern either of color or pubescence.

Elytra subparallel-sided, not at all cuneate or subtriangular, the wings in repose being concealed beneath them. The antennae are comparatively short and stout, the anteapical joints little or not at all elongated. The hind tibiae and tarsi above are only sparsely clothed with short hairs, the basal joint of the latter beneath is very densely clothed with short hairs similar to the clothing of the following joints. The general covering of the insect consists of short pale hairs, forming no pattern and leaving the sculpture easily visible. The latter consists of a dense, but not coarse puncturation over almost the whole dorsal surface of the insect. In dorsal aspect the median pronotal crest is not or hardly evident, being marked only by more or less evident differences in the sculpture from the adjoining parts. Type of the genus *Aeschrithmysus terryi.*

Aeschrithmysus terry sp. nov.

Dark fuscous or more or less pitchy, clothed with short whitish decumbent hairs, not altogether evenly distributed but still not forming any pattern. The tibiae, tarsi, mandibles basally, antennae more or less, and parts of the ventral surface are redder.

Head dull, densely punctured, the median impressed facial line very distinct. Antennae with only very minute and inconspicuous clothing, the tenth joint about as long as wide. Pronotum viewed from the side very strongly, but not vertically declivous in front, posteriorly much more obliquely so, while between these points the outline is nearly straight. In dorsal aspect the median crest is indicated only by some smoother transverse wrinkles or spaces amongst the dense puncturation. The sides of the pronotum are well rounded and its width at the middle is about equal to that of the elytra near their base; its clothing is unevenly distributed, being apparently absent on the middle part of its length. Elytra with very dense even puncturation, dull or nearly so, the punctures remaining quite distinct to the apex, though rather finer there than on the basal parts. The clothing of short whitish hairs appears to be absent from the slightly raised or convex longitudinal ridges. The length of the elytra is more than twice but not two and a half times their breadth at the base. Mesopleura with a patch of denser hairs; metasternum closely and subrugosely punctured. Abdominal sternites dull, sparsely haired, copiously punctate except along the apical margins, the fifth widely subtruncate and very densely and shortly ciliated at the apex. The

hind femora are strongly clavate, the incrassation gradual and sparsely clothed with short, depressed hairs. Length 16-17 mm.

Maui, Haleakala Crater, from silversword, VIII—1927 (Degener). Two specimens.*

Aeschrithmysus swezeyi sp. nov.

Closely allied to the preceding, which it largely resembles in general appearance, but it is evidently more elongate, the elytra being more than two and a half times as long as their basal width. They are also less dull, less densely punctured, and the sculpture on the apical portions becomes more obsolete and rugulose and altogether less definite. The femora are much less clavate, the tarsi evidently narrower; the pronotum is less strongly rounded at the sides and the ill-developed median crest in dorsal aspect is more scabrous while the sublateral crests are indicated posteriorly by slight oblique elevations. Length 15-16 mm.

Maui, Haleakala Summit, 17-VI-27, two specimens collected from *Raillardia ciliolata* (Swezey).

Obs. One of the above species, probably *Ae. swezeyi,* was collected singly on two different occasions many years ago near the summit of Haleakala. The first of these might possibly be found amongst some of the duplicate or unworked beetles in the late Dr. Sharp's collection, in the material which did not become the property of the British Museum. The other was captured by the late Mr. Terry of the H. S. P. A. Experiment Station, about 25 years ago and, if not in the Bishop Museum, was probably given by him through Mr. Waterhouse of the British Museum to that institution, amongst a number of other Hawaiian insects. Though I saw these specimens when newly caught, I was not at the time specially interested in the Hawaiian Longicorns, and made no critical examination of them, but I have no doubt as to their belonging to the above-named genus. In 1896 when collecting with Mr. Koebele in Haleakala Crater, I brought down plants of silversword containing beetle, fly and moth larvae, but as there was no one to attend to the material in Honolulu, except countless specimens of Tephritis, very little was obtained from this. One or two bad or crippled specimens of a dark phycitid emerged, during my absence, but no beetle of any sort. I hoped at the time that I might obtain the weevil *Heteramphus nivicola,* described on a fragmentary example, found near some silversword plants, but as the larvae were not examined, it is possible they may have belonged to Aeschrithmysus.

* See Proc. Haw. Ent. Soc., VII, No. 1, p. 164, 1928.

Xenos auriferi Pierce in Hawaii (Strepsiptera)

BY O. H. SWEZEY

(Presented at the meeting of January 5, 1928)

For quite a number of years it has been known that *Polistes aurifer* Sauss. in Hawaii has been infested by a species of Stylopidae. At the August 5, 1910, meeting of the Hawaiian Entomological Society, "Mr. Terry exhibited male and female specimens of Xenos in the body of *Polistes aurifer*." See Proc. Haw. Ent. Soc., II, No. 4, p. 181, 1912. This is apparently the first and only record of its occurrence here.

In the collections at the Experiment Station, H. S. P. A., are a number of specimens of *Polistes aurifer* containing empty male stylopid exuviae bearing dates as follows: Oct. and Nov., 1907; Oct. 12, 1913; and Oct. 6, 1914. All are from various regions of Honolulu. There are also specimens of male stylopids dated: Oct. 14, 1914; Nov. 5, 1914; Nov. 8, 1914; and Dec. 16, 1927, similarly from various parts of Honolulu.

At other times, the writer has noticed affected wasps, without collecting them, and all in Honolulu. It is not known how general in the Islands this wasp parasite may be distributed.

Recently, I secured on Dec. 13, 1927, a nest of *Polistes aurifer* and the wasps that were associated with it. They were all adults that had been produced in the nest during the summer of 1927. The nest was a rather large one for this wasp, containing 201 cells, and was attached to a branch of *Ficus palawanensis* about five feet from the ground, the tree standing in my front yard at 2048 Lanihuli Drive, Manoa. The nest had been under observation for some time to ascertain how late the wasps remained with the nest before deserting it for the winter. This wasp passes through a sort of hibernation, or period of idleness for a few months as though it was passing through a winter like where it came from. Finally on the morning of Dec. 13, after a heavy rain during the night, the nest was found lying on the ground and the wasps all clustered on it. The whole colony was readily secured in a tin can, and later transferred to a large battery jar for observations. Many were seen to be affected by stylopids.

From day to day, the wasps that died were examined for stylopids and records kept of the number of wasps that were parasitized and of the number and sex of the parasites in each. The male stylopids had already issued, so that only the empty exuviae remained. However, in two instances, the dead male was found present, having failed to issue. A good proportion of females were found, and from some of these the larvae or triungulins were observed issuing and crawling about on the wasp. Specimens were mounted, and some preserved in alcohol.

In examination of literature, the description of *Xenos auriferi* Pierce was found in Proc. U. S. Nat. Mus., 40, No. 1834, p. 498, 1911. The species is described from a single female collected from *Polistes aurifer* in Palo Alto, California, Feb. 1892, by W. G. Johnson, and received from Professor Henry Comstock. Comparing specimens recently obtained, with this description, I consider them the same. The coloration of the cephalothorax agrees, and it is different from that of the other 15 species of Xenos listed by Pierce. There is some discrepancy in measurements, but this varies anyway among the several specimens that I have examined, while the description, as stated, is from an individual specimen.

On December 31, a dead female Xenos in a dead female wasp contained numerous embryos and some black triungulinids about ready to hatch.

On Feb. 13 and Feb. 21, 3 dead female Xenos in dead female wasps were examined and the triungulinids were not hatching yet. One dead female Xenos examined Feb. 21, contained over 3000 ova and triungulinids.

On Feb. 21, two wasps were dissected, each containing a female Xenos. The latter had numerous undeveloped ova, and a few about ready to hatch. One wasp seemed to have no ovarian tubes. The other wasp had the ovarian tubes of one side only—the side not containing the Xenos.

These observations demonstrate how the parasite is carried over the winter season as fertile females within the female wasps that go through the winter. Two other species of Polistes (*hebraeus* and *macaensis*) are prevalent in Hawaii, but they have never been found attacked by Xenos. In the above colony of *Polistes aurifer*, 50% of the males and 49% of the females were parasitized by *Xenos auriferi.*

TABLE SHOWING PARASITISM OF WASPS

Date	Dead Polistes examined		Xenos auriferi number per wasp		
	Male	Female	Male exuvium	Adult male	Female
		1	2		
		1	3		
		1	1		
		1	1		
Dec. 16, 1927	1		4	1 (dead)	
		1	1		2
		1	1		1
		1	1		1
	1		1		1
		1	1		
		1	1		2
		1	2		2*
Dec. 20	1			0	0
		1	4		
		1			1*
Dec. 21	1		0	0	0
		1			2
Dec. 27		1			1
		10	0	0	0
		1	1		1
		1			1
Jan. 3, 1928		1			1
		1	2		1
Jan. 4		1		1 (dead)	2*
Jan. 9		1	0		0
		1			2
Feb. 7		1			1
Feb. 13		1			2
		1			1
		1			1
		1			1
Feb. 21		1			1
		1			1
		1			1
		16**			
	4	55	26	2	30

* The triungulinids were issuing from these and crawling about on the wasp.
** Living unparasitized wasps that were examined and liberated.

The Earliest Described Hawaiian Insects

BY O. H. SWEZEY

(Presented at the meeting of Feb. 2, 1928)

In the December, 1927, issue of the Entomological News is a paper by S. A. Rohwer on The Earlier Described Insects in America. It aroused my interest in endeavoring to ascertain what were the first native Hawaiian insects to be named and described. So far as I have been able to ascertain, the wasp known as *Odynerus radula* (Fabr.) was the first Hawaiian insect named and described (Fauna Hawaiiensis, I, Pt. I, p. 71, 1899).

This wasp was in the Banks' collection and described by Fabricius as *Vespa radula* in Mant. Insect., I, p. 290, n. 44, 1787. A description is also given by him in Entomologia Systematica, II, p. 269, n. 58, 1793. The habitat is given as Sandwich Islands. As this is one of the commonest Kauai wasps and does not occur on any other island, and as this description is only a few years later than the landing of Captain James Cook at Waimea, Kauai, Jan. 21, 1778, it seems very likely that it was collected by some one of Captain Cook's party. This seems all the more probable when we read in Captain Cook's account that several days were spent at anchor, probably near the mouth of what is now known as Waimea River, and on one of the days he and Messrs. Anderson and Webber took a walk up the valley, where they visited a burial place which he describes. He also describes many other things, as the people themselves, the soil, the rocks, the plants, etc. Giving such close attention to everything thus, it would be expected that some of the insects would have been noticed and collected, which is more than likely just what happened and the specimens somehow eventually were placed in the Banks' collection.

Sir Joseph Banks accompanied Captain James Cook on his first voyage in the Pacific, 1768-71. This was in the South Pacific, where they visited Tahiti, New Zealand, Australia and the Dutch East Indies. The most of Banks' insect collecting was done while the ship "Endeavor" was stranded and laid up for repairs for four months in 1770, at Endeavor River, where Cooktown, New

Zealand, now stands. Sir Joseph Banks was not with Captain Cook on the voyage when he discovered the Hawaiian Islands, and landed at Waimea, Kauai, as before mentioned, but one can readily infer that his presence on a previous voyage and collecting insects would have aroused sufficient interest in insects so that any that might have been taken on a subsequent voyage would have been turned over to him.

One other insect described by Fabricius from the Banks' collection undoubtedly was collected at the same time and place and reached the Banks' collection in the same manner. I refer to what is now known as *Echthromorpha fuscator* (Fabr.), a black ichneumonid which is common throughout the Hawaiian Islands from the coast to the mountain tops. It was described by Fabricius as *Ichneumon fuscator* in Entomologia Systematica, II, p. 163, n. 123, 1793, from the Banks' collection, "Habitat in Insulis Sandwichii." In a later publication, he refers to it as *Cryptus fuscator* (Syst. Piezata, p. 85, n. 59, 1804). In the Fauna Hawaiiensis, I, Pt. III, p. 336, 1901, it is listed as *Echthromorpha maculipennis* Holmgren, described by him in Eugenies Resa, Insekter, p. 406, n. 33, 1868.

In Proceedings Hawaiian Entomological Society, II, No. 5, p. 192, 1913, Dr. Perkins calls attention to a paper by Morley in The Entomologist, 1909, pp. 131-36, "On the Ichneumonidae of the Banksian collection in the British Museum," in which *Cryptus fuscator* Fabr. is referred to, and which Dr. Perkins considers the same insect as *Echthromorpha maculipennis* Holmgren.

This is a very important insect in the control of Lepidoptera in the Hawaiian Islands. With its rigid ovipositor it oviposits into the host pupa, oftentimes where enclosed within cocoon or spun together leaves. A common host is the suspended chrysalis of the Kamehameha butterfly, *Vanessa tammeamea* Esch. Collectors who have been so fortunate as to find a number of these chrysalids and have anticipated obtaining a goodly number of the butterfly, have always been disappointed, for always more of the parasite would issue than of the buterfly. Other hosts from which it has been reared are: *Vanessa cardui* (L.), *Lycaena boetica* L., *Plusia chalcites* Esp., *Omiodes blackburni* (Butl.), *Omiodes accepta* (Butl.), *Euhyposmocoma trivitella* Sw., *Amorbia emigratella*

Busck, *Archips postvittanus* (Walker) and *Capua reynoldsiana* Swezey. The larva pupates within the host chrysalis without making a cocoon. The adult issues from the anterior end by breaking a somewhat ragged hole.

Status of Sugar Cane Pests in Hawaii in the Year 1927

BY O. H. SWEZEY

(Presented at the meeting of March 1, 1928)

Leafhopper, Perkinsiella saccharicida Kirk.

No infestations of any importance came to our attention during the year. Most everywhere in the cane fields only an occasional leafhopper was to be found. In a few instances they became noticeably numerous but not abundant enough to be injurious. Their enemies soon increased so as to have the pest again reduced to scarcity. The chief enemies were *Paranagrus optabilis* and *Ootetrastichus beatus,* introduced egg-parasites, and *Cyrtorhinus mundulus,* the small bug which sucks the eggs, introduced from Australia.

Cane Borer, Rhabdocnemis obscura (Boisd.).

The borer has been in the usual satisfactory control by the N. Guinea Tachinid (*Ceromasia sphenophori* Vill.), except in a number of instances where mature cane has stood for a long time before harvesting, and the borers were working on the cane that was buried beneath an accumulation of dead leaves or trash, so that the infested canes were not accessible to the parasites. A considerable amount of loss has resulted thus. On one plantation the loss was estimated at $200,000.00.

Leafroller, Omiodes accepta (Butl.).

No outbreak. Hardly any noticeable injury by this pest for a number of years.

Armyworms, Cirphis unipuncta (Haw.) and **Spodoptera mauritia** (Boisd.).

Quite satisfactorily controlled now in most places since the introduction of the parasites from Mexico in 1923. There are now at least eight valuable introduced parasites working on armyworms.

Only two outbreaks of any importance were reported during the year. These were of the nutgrass armyworm, and the cane soon recovered from the setbacks received when quite young.

Cane Grub, Anomala orientalis (Waterh.).

No injury. Only rarely a specimen of the beetle or grub met with. Kept in control by the introduced Philippine wasp *Scolia manilae* Ashm.

Aphis sacchari Zehntner.

No serious infestations. Well controlled by introduced ladybeetles, parasites, lacewing flies and syrphid flies.

Mealybugs.

Pseudococcus boninsis (Kuwana) is so completely controlled by *Aphycus terryi* as to be rarely met with. *Trionymus sacchari* (Ckll.) generally prevalent as usual. The introduced ladybeetles on mealybugs do not attack this species to much extent, being so well secluded behind the leafsheaths. No mealybug parasite works on this mealybug here.

Mole Cricket, Gryllotalpa africana (Beauv.).

Only in a few instances was there injury by this pest. In each case where cane was planted in wet or swampy regions infested by mole crickets which ate out some of the "eyes" of the cuttings, so as to necessitate replanting. A parasite (*Larra luzonensis* Rohwer) has been introduced and is now well established. It will no doubt in time bring about a reduction of damage by this pest.

Grasshopper, Oxya chinensis (Thunb.).

There were a few instances in which this grasshopper ate cane sufficiently as to make a very ragged appearance, and possibly made somewhat of a check to the cane. These were always where there was an abundance of nutgrass in the fields or along roadsides and borders of fields.

Wireworms, Monocrepidius exsul Sharp.

No trouble from wireworms was reported. Perhaps this was due to non-planting of fields last year in the regions where wireworms were prevalent as the injury by them is chiefly eating out the "eyes" of recently planted "seed" cane.

Records of Immigrant and Recently Introduced Insects on Kauai

BY O. H. SWEZEY

(Presented at the meeting of April 5, 1928)

Xiphidiopsis lita Hebard.

This insect was observed in the garden at Lihue Hotel, March 11, also on several successive evenings coming to light at the hotel. No specimens were secured. The first record of it on Kauai.

Phthorimaea lycopersicella Busck.

This moth was reared from tomato leaves collected in the garden of Lindsay Faye, Waimea, Kauai, March 21. First record of its occurrence on Kauai.

Engytatus geniculatus Reuter.

This bug was collected on tomato vines at an old camp in the upper part of Kilauea Sugar Plantation Company, March 14, 1928. First record on Kauai.

Bruchus sp. near **coryphae.**

At Nawiliwili, March 11, numerous seeds and capsules of *Ipomoea pes-caprae* were found perforated by this weevil. Eggs were also found on green capsules. The first record of the insect on Kauai.

Chrysis extraniens Rohwer.

Three cocoons were found in nests of *Sceliphron caementarium* occurring under the porch roof of the plantation office at Kilauea Sugar Plantation Company, March 14, 1928. The only previous record of its occurrence on Kauai was in September, 1920, when I saw one on a fence at Lihue, but failed to catch it.

Bactra truculenta Meyrick.

This Philippine nutgrass moth borer was found established in all plantation districts wherever nutgrass patches were examined. Usually the affected plants were scarce and hard to find, but in a nutgrass patch in Hanapepe Valley in a cane field, and in another patch similarly located at Mana they were so numerous that 36 were counted per square foot. This insect has become established and spread from colonies liberated on a few of the plantations in the summer of 1927.

Anthomyia bisetosa Thomson.

A fly was collected on the window of the Lihue Plantation Company's office on March 13, 1928. The first record on Kauai.

Telenomus nawai Ashm.

This armyworm egg-parasite was reared from eggs of *Spodoptera mauritia* collected on palm leaves at Lihue Hotel, County Building grounds and on sugar cane leaves in Waimea Valley, March 11, 19 and 22 respectively. This is the first knowledge of its having become established on Kauai.

Cremastus hymeniae Viereck.

The coconut leaves everywhere on Kauai are in nearly perfect condition, apparently due to the work of *Cremastus* in checking the coconut leafroller *Omiodes blackburni.* At Kealia, March 15, on a small coconut tree quite a number of caterpillars were found, and they were found to be 85 per cent parasitized by *Cremastus hymeniae.*

Hyposoter exiguae (Viereck).

A cocoon of this parasite of caterpillars was found at Kumuwela, March 9. It is the first knowledge of its becoming established on Kauai.

Monopis meliorella (Walker).

One moth was collected in Hanapepe Valley, March 17. The first record for Kauai.

Curinus coeruleus (Muls.).

One of these ladybeetles, introduced from Mexico, was collected in the grounds of Lindsay Faye, Waimea, March 21. It is the first record of its establishment on Kauai.

Coccotrypes pygmaeus (Eich.).

In the Lihue Hotel grounds this scolytid was found attacking date seeds on the ground under a date tree. At Koloa, date seeds were found similarly affected. The first record of it on Kauai.

Ripersia palmarum Ehrhorn.

This mealybug was found on a young coconut tree at the County Building grounds at Lihue, March 19, 1928. Not previously recorded from Kauai.

Thoracaphis fici Bakĕr.

Found common on leaves of *Ficus retusa* in the grounds of Lindsay Faye, Waimea, March 21. Not previously recorded from Kauai.

List of Lepidoptera at the Bishop Museum, Collected by J. August Kusche on Kauai in 1919 and 1920

BY O. H. SWEZEY

(Presented at the meeting of May 3, 1928)

Of this valuable addition to the Bishop Museum collection of Hawaiian insects, the larger lot, collected in 1919, was obtained by purchase, and those collected in 1920 were donated to the Museum by Mr. Kusche. The moths of this list were chiefly caught at light in different regions of the high plateau of Kauai during two periods of time, about January to April in 1919, and April, 1920. Many of the species were taken in large series. Those in the list marked thus * were not previously in the collection. Those marked thus ♯ were not recorded from Kauai in the Fauna Hawaiiensis.

There are 164 species enumerated in the list, 22 of which were not previously in the Bishop Museum collection, and 55 of which were not recorded from Kauai in the Fauna Hawaiiensis. Six species were new to science and are as follows:

Agrotis stenospila Meyrick, Proc. Haw. Ent. Soc., VII, No. 1, p. 92, 1928.

Euxoa charmocrita Meyrick, Proc. Haw. Ent. Soc., VII, No. 1, p. 91, 1928.

Plusia violacea (Swezey), Proc. Haw. Ent. Soc., IV, No. 2, p. 337, 1920.

Nesamiptis senicula Meyrick, Proc. Haw. Ent. Soc., VII, No. 1, p. 93, 1928.

Nesamiptis proterortha Meyrick, Proc. Haw. Ent. Soc., VII, No. 1, p. 93, 1928.

Scotorythra crocorrhoa Meyrick, Proc. Haw. Ent. Soc., VII, No. 1, p. 94, 1928.

	CARADRINIDAE	PUU KAPELE	HALEMANU	KOKEE	KAHOLUAMANO	OLOKELE CANYON	WAIALEALE	ALAKAI SWAMP	KAPAA
30	Eriopygodes euclidias (Meyr.)		"	"	"		"		
23	Aletia pyrrhias (Meyr.)			"	"	"		"	
4	" amblycasis (Meyr.)			"	"				
29	# " unipuncta (Haw.)		"	"	"			"	
13	Agrotis ypsilon Rott.			"	"				
1	# " crinigera (Butl.)								
38	" selenias Meyr.			"	"			"	
4	" cinctipennis (Butl.)				"				
7	" coniotis Hampson		"	"	"			"	
2	*# " stenospila Meyr.			"	"				
7	Lycophotia margaritosa (Haw.)		"	"	"			"	
8	Euxoa dislocata (Walk.)		"	"	"		"		
6	" tephrias (Meyr.)		"	"	"			"	
1	# " mesotoxa (Meyr.)				"				
7	# " psammophaea (Meyr.)			"	"		"		
5	" austalea (Meyr.)			"	"				
15	*# " wikstroemiae Swezey			"	"	"	"	"	
3	# " xiphias (Meyr.)		"	"					
2	*# " charmocrita Meyr.				"	"			
5	# Chloridea obsoleta (Fab.)		"	"					
1	# Spodoptera exigua (Hüb.)	"							
9	* Caradrina reclusa Walker		"	"					
	PLUSIADAE								
1	# Simplicia robustalis Guen.								
3	* Adrapsa manifestalis (Walk.)								"
6	Hypenodes altivolans (Butl.)			"	"		"		"
24	Nesamiptis obsoleta (Butl.)			"	"	"	"		
2	*# " senicula Meyr.				"				
2	*# " proterortha Meyr.				"				
26	Cosmophila noctivolans (Butl.)	"		"	"		"		
22	" sabulifera (Guen.)			"	"	"			"
1	# Hypocala velans Walker					"			
2	# Plusia biloba Stephens			"	"		"		
6	# " chalcites Esp.			"	"				"
1	*# " violacea (Swezey)			"					
	HYDRIOMENIDAE								
2	# Eucymatoge orichloris Meyr.				"				
86	" monticolans (Butl.)	"		"	"	"	"		
6	* Hydriomena leucoxyla (Meyr.)			"	"				
2	# Prognostola cremnopis Meyr.				"				

		SELIDOSEMIDAE	PUU KAPELE	HALEMANU	KOKEE	KAHOLUAMANO	OLOKELE CANYON	WAIALEALE	ALAKAI SWAMP	KAPAA
5		Scotorythra syngonopa Meyr.			"	"	"			
5		" arboricolans Butl.	"		"	"				
29		" isospora Meyr.			"	"	"	"		
11		" hecataea Meyr.			"	"		"		
32		" trapezias Meyr.		"	"					
2	#	" idolias Meyr.				"				
39		" paludicola (Butl.)		"	"	"		"		
5	#	" oxyphractis Meyr.		"	"	"				
54		" nephelosticta Meyr.		"	"	"	"	"	"	
15		" trachyopis Meyr.		"	"					
2		" macrosoma Meyr.				"	"			
1	#	" pachyspila Meyr.				"				
24	#	" brachytarsa Meyr.		"	"	"	"			
275		" rara (Butl.)		"	"	"	"	"	"	
54		" euryphaea Meyr.		"	"	"				
9	*#	" crocorrhoa Meyr.			"		"			
		NYMPHALIDAE								
2		Anosia erippus Cramer			"					
11		Vanessa tammeamea Esch.			"	"	"			
1		" cardui Linn.						"		
1	#	" virginiensis Drury			"					
		LYCAENIDAE								
16	#	Lycaena boetica (L.)			"		"	"		"
17		" blackburni (Tuely)			"	"	"			
3	#	Thecla echion (L.)					"			"
15	#	" agra Hew.			"		"			"
		PIERIDAE								
4	#	Pontia rapae (L.)			"	"				
		PHYCITIDAE								
24		Genophantis iodora Meyr.			"	"	"			
1		Homoeosoma humeralis (Butl.)			"	"				
34		" amphibola Meyr.			"	"		"		
		CRAMBIDAE								
1		Talis geralea Meyr.				"				

	PYRAUSTIDAE	PUU KAPELE	HALEMANU	KOKEE	KAHOLUAMANO	OLOKELE CANYON	WAIALEALE	ALAKAI SWAMP	KAPAA
2	Nymphula fluctuosalis Z.	"							
1	# Margaronia exaula (Meyr.)					"			
16	" cyanomichla (Meyr.)			"	"	"			
13	Omiodes accepta (Butl.)		"	"	"				
3	*# " antidoxa Meyr.			"		"			
15	" continuatalis (Wall.)				"	"			"
21	" monogramma Meyr.		"	"	"	"	"		
5	" demaratalis (Walk.)					"			
12	" monogona Meyr.				"	"	"		
10	" localis (Butl.)				"	"	"		
2	*# " maia Swezey					"			
13	Hymenia recurvalis (Fab.)	"		"		"			
1	*# " exodias Meyr.				"				
8	Phlyctaenia calliastra Meyr.	"		"	"	"			
4	" monticolans (Butl.)				"				
3	" nigrescens (Butl.)				"		"		
2	# " iocrossa Meyr.			"					
3	" micacea (Butl.)	"			"				
5	" eucrena (Meyr.)			"					
5	*# " ommatias Meyr.			"					
11	" stellata (Butl.)			"	"		"		
13	" argoscelis (Meyr.)			"	"		"		
38	" despecta (Butl.)	"		"	"	"	"		
1	# " rhodias Meyr.				"				
15	" pyranthes Meyr.			"	"	"			
6	Pyrausta chloropis Meyr.				"				
22	" brontias Meyr.	"		"	"	"	"		
7	" psychropa Meyr.			"	"	"	"		
16	# " constricta (Butl.)			"	"	"			
1	# Mecyna aurora (Butl.)				"				
16	" virescens Butl.			"	"	"	"		
13	Loxostege helioxantha Meyr.			"	"	"			
19	Nomophila noctuella Schiff.			"	"		"		
6	Hellula undalis (Fab.)	"				"			
1#	Evergestis anastamosalis (Guen.)			"					
1	Mestolobes minuscula (Butl.)								"
1	* " orthrias Meyr.				"				
1	Orthomecyna chrysophanes Meyr.					"			
2	" mesochasma Meyr.			"					
7	Scoparia rhombias Meyr.				"	"			
12	" amphicyphella Meyr.			"	"				
9	" oxythyma Meyr.				"	"			
11	" gonodecta Meyr.			"	"				

		PUU KAPELE	HALEMANU	KOKEE	KAHOLUAMANO	OLOKELE CANYON	WAIALEALE	ALAKAI SWAMP	KAPAA
23	" cryerodes Meyr.			"	"	"			
4	" ianthes Meyr.			"	"				
23	" thyellopis Meyr.	"		"	"	"			
1	*# " zophochlora Meyr.			"					
32	" halmaea Meyr.	"		"	"	"	"		"
4	" platyscia Meyr.			"	"				
22	" probolaea Meyr.			"	"	"	"		
12	" omichlopis Meyr.			"	"	"			
3	*# Hydriris exaucta Meyr.			"	"				
5	Lineodes ochrea Walsm.				"	"			
	PTEROPHORIDAE								
1	# Trichoptilus oxydactylus (Walk.)			"					
5	Platyptilia fuscicornis Z.				"				
7	# " brachymorpha Meyr.				"		"		
14	" rhynchophora Meyr.			"	"				
9	# " littoralis Butl.			"	"				
	GELECHIADAE								
5	Stoeberhinus testaceus Butl.	"				"			
17	Psychra phycidiformis Walsm.			"	"				
10	Thyrocopa gigas (Butl.)	"		"	"	"			
1	* " (?)cinerella Walsm.				"				
5	" usitata (Butl.)			"	"	"	"		
	OECORPHORIDAE								
2	# Ethmia colonella Walsm.				"				
	HYPONOMEUTIDAE								
1	# Aphthonetis bitincta Walsm.				"				
1	Neelysia municeps Walsm.				"				
4	Hyposmocoma nividorsella Walsm.				"				
7	" discella Walsm.				"				
4	" divisa Walsm.				"				
5	" lupella lupella Walsm				"				
2	" lupella candidella Walsm.				"				
3	" chilonella triocellata Walsm.				"	"			
5	Diplosara lignivora (Butl.)				"				

	CARPOSINIDAE	PUU KAPELE	HALEMANU	KOKEE	KAHOLUAMANO	OLOKELE CANYON	WAIALEALE	ALAKAI SWAMP	KAPAA
1	Heterocrossa graminicolor Walsm. ...				"				
4	" olivaceonitens Walsm.			"	"				
13	" graminis Walsm.				"				
5	" corticella piperatella Walsm.....				"		"		
6	" divaricata Walsm.				"				
	TORTRICIDAE								
10	Eccoptocera foetorivorans (Butl.) ...				"				
3	# Crocidosema marcidellum (Walsm.).....				"				
1	" plebiana Z.				"				
4	# Argyroploce illepida (Butl.)				"	"			
5	# Cryptophlebia vulpes Walsm.				"				
3	# Enarmonia walsinghami (Butl.).....				"	"			
5	Bactra straminea (Butl.)				"				
10	Archips postvittanus (Walk.)	"		"	"	"			
7	" longiplicatus Walsm.			"	"	"			
16	*# Amorbia emigratella Busck.			"	"		"		"
3	Dipterina fulvosericea Walsm.			"	"				
4	* Tortrix thoracina Walsm.			"	"				
1	* Capua flavopicta Walsm.			"					
3	" picta Walsm.				"				
1	*# " flavocincta Walsm. (?)				"				
4	Epagoge infaustana Walsm.				"				
	TINEIDAE								
2	# Ereunetis simulans (Butl.)			"	"				
1	# Monopis monachella (Hb.)				"				
11	# Opogona omoscopa (Meyr.).....	"			"				

Sitophilus rugicollis (Casey) in Hawaii (Col., Cucurlionidae)

BY O. H. SWEZEY

(Presented at the meeting of May 3, 1928)

Among some specimens recently handed to me by Mr. Bryan for determination, was one specimen of *Sitophilus rugicollis* (Casey), which was in a collection handed in by one of the students in Entomology at the University of Hawaii. He had collected this weevil in a house. It is the first record of its occurrence in Honolulu.

The species was described in 1892 on a single specimen from Florida, and has not been seen there since, according to Cotton (Proc. Ent. Soc. Washington, 26, p. 141, 1924). In this note by Cotton, he explains the synonomy of *S. shoreae* (Marshall), described from India in 1920 (Bull. Ent. Research, XI, p. 276, Pl. VII, Fig. 4, 1920). Marshall states that it attacks the seeds of *Shorea robusta* and *Dipterocarpus turbinatus*. It is known in various parts of India, and also in Mauritius.

Whether this single specimen is a stray that has come in in freight in some way, or whether it is established here in seeds of some tree is not yet known.

Parthenogenesis in a Phasgonurid, Xiphidiopsis lita, in Hawaii (Orthoptera)

BY O. H. SWEZEY

(Presented at the meeting of Nov. 1, 1928)

This immigrant to Hawaii was first observed by Mr. C. E. Pemberton in July, 1919, at Hilo, Hawaii. It came to lights at the Hilo Hotel. In a year or two it increased in numbers so that it appeared quite abundant, as many as a hundred could be observed in a single evening at the porch lights of the Hilo Hotel in August, 1921, and it began to be found at other places on the island of Hawaii, till it finally became generally dispersed. The first finding of it in Kona was in 1924.

In September, 1923, it was first observed in Honolulu, probably having come from Hilo on an Inter-Island steamer at night time.

It gradually spread on Oahu, till now it has been recovered from extreme parts of the island.

The species was described by Mr. Morgan Hebard in "Occasional Papers" of the Bishop Museum, Vol. VII, No. 14, p. 345, pl. XXVI, figs. 12, 13, 1922. It is not yet known from whence it came to Hawaii. Mr. Hebard remarks in regard to this insect, "Without males of this insect we are unable to make as full a comparison as could be desired." The absence of males was noted from the first observations on the insect in Hawaii. Even when it had increased so that 100 could be counted in a single evening at lights at the Hilo Hotel, they were all females, as could be readily seen by the long ovipositor. Thinking that perhaps males were not attracted to lights, and that they might be found in the vicinity, search was made on different occasions in the Hotel gardens and surrounding regions, but always failing to find any male specimens. Even to this day none have yet been found, and the entomologists have vied with one another in the endeavor to be the first to catch a male. At one time a male was reported by Brother Matthias Newell in Hilo, but his specimen was later identified as the common *Conocephalus saltator* (Sauss.).

It was early suspected that this insect was predacious, and experiments and observations were made to demonstrate it. Record of some observations in this respect are in Proc. Haw. Ent. Soc., VI, pp. 226 and 229, 1926, where the following insects are recorded as eaten by an adult female in confinement: corn aphis, *Cerataphis fici,* tineid moths and small noctuid caterpillars. Oviposition and the egg are described in Proc. Haw. Ent. Soc., VI, p. 229, 1926.

In February, 1928, a nymph was confined in glass jar and fed with drosophilid flies until it matured. In due time (March 3) six eggs were found. The female died March 6, and was found to contain a mass of 43 eggs. The 6 eggs that were found on March 3, had not hatched yet on March 31, but embryos were developing in them and the compound eyes could be seen through the egg shell, which demonstrates that reproduction can take place by parthogenesis, and, since males have never been found, it is likely that that is the prevailing method of reproduction of *Xiphidiopsis lita* in Hawaii.

The Hosts of Cremastus hymeniae Viereck in Hawaii (Hymenoptera)

BY O. H. SWEZEY

(Presented at the meeting of Nov. 1, 1928)

While Mr. Hubert W. Simmonds, the Government Entomologist of Fiji, was here in October, he became interested in *Cremastus hymeniae* which is an important parasite of our coconut leafroller (*Omiodes blackburni* [Butler]) and secured a colony of it to take back with him. The banana scab moth (*Nacoleia octasema* Meyrick) in Fiji is near related to our coconut leafroller, and from the fact that this Cremastus has such a wide range of hosts, Mr. Simmonds thought that it might take to the banana scab moth and thus prove very beneficial in Fiji. For Mr. Simmonds' information I got together a list of the known hosts of *Cremastus hymeniae* in Hawaii. I think that it is advisable to record this list for future reference.

Family	
Phycitidae	*Genophantis iodora* Meyrick
Pyraustidae	*Omiodes blackburni* (Butler)
	" *accepta* (Butler)
	" *meyricki* Swezey
	" *monogona* Meyrick
	" *musicola* Swezey
	" *localis* (Butler)
	Hymenia recurvalis (Fabr.)
	Phlyctaenia stellata (Butl.)
	" *calcophanes* Meyr.
	" *platyleuca* Meyr.
	" *iocrossa* Meyr.
	" sp.
	Chilo simplex (Butl.)
Tortricidae	*Tortrix metallurgica* Walsm.
	Epagoge infaustana Walsm.
	Capua santalata Swezey
	" *reynoldsiana* Swezey
Eucosmidae	*Adenoneura falsifalcellum* Walsm.
	Argyroploce illepida (Butl.)
	Crocidosema marcidellum (Walsm.)
	" *lantana* Busck
	Bactra straminea (Butl.)
Carposinidae	*Heterocrossa graminicolor* Walsm.
Cosmopterygidae	*Bactrachedra cuniculator* Busck
	Pyroderces rileyi (Walsm.)
Tineidae	*Ereunetis minuscula* Walsm.
	" *flavistriata* Walsm.
Cygnodidae	*Petrochroa dimorpha* Busck

Notes on the Egg-parasites of Insects in Hawaii

BY O. H. SWEZEY

(Presented at the meeting of December 10, 1928)

As a convenience for reference, an attempt is here made to assemble our present knowledge of those insects in Hawaii which pass their immature stages within the eggs of other insects, or otherwise destroy them. The list as given includes the native species as well as those purposely introduced, and natural immigrants. A few insects are also included which destroy eggs of spiders. The purposely introduced species are designated by an asterisk.

HYMENOPTERA

EVANIIDAE

Evania sericea Cameron
Trans. Ent. Soc. London, p. 191, 1883.

Evania appendigaster (Linn.)
Sys. Nat., Ed. X, I, 1758.

Both these species of Evania are generally distributed throughout the Hawaiian Islands. The larvae are parasitic in the egg capsules of roaches such as: *Periplaneta americana* (Linn.), *P. australasiae* (Fabr.), *Neostylopyga rhombifolia* (Stoll) and *Cutilia soror* (Brunn.). One adult parasite issues per egg capsule.

ICHNEUMONIDAE

Arachnoleter swezeyi Cushman
Proc. U. S. Nat. Mus., 64, No. 2494, p. 3, fig. 1, 1924.

The larvae of this insect feed on the eggs of spiders in their silken egg cocoons. There may be as many as three per egg cocoon. The brown cocoons of the parasites are constructed within the empty egg cocoon. The species is known on Oahu and Hawaii. The host spiders have not been determined.

Diplazon laetatorius (Fabr.)
Spec. Insect, I, p. 424, 1781.

A parasite of the two syrphid flies whose maggots prey on aphids: *Ischiodon scutellaris* (Fabr.) and *Allograpta obliqua* (Say). I have not made the observation myself, but Professor Essig states

in Insects of Western North America, p. 794, that "The adults oviposit in the eggs of the hosts. The eggs hatch together and the larvae of the parasite do not fully mature until the pupal stage of the host is reached." The adult parasite issues from the puparium of the host.

BRACONIDAE

Chelonus blackburni Cameron

Proc. & Mem. Manchester Litt. & Phil. Soc., X, p. 242, 1886.

This insect oviposits in the eggs of its hosts, but does not develop until after the caterpillar hatches and develops to maturity. The caterpillar containing the developing parasite does not become fully normal size. However, it spins its cocoon for pupation, soon thereafter the parasite larva finishes its growth and issues from the host caterpillar to spin its own white cocoon within the host cocoon. One parasite develops per host. It is generally distributed in the Hawaiian Islands, including Midway, Laysan, Pearl and Hermes Reef, and has several hosts. Probably its most favorite host is *Hymenia recurvalis* (Fab.). Other hosts are: *Platyedra gossypiella* (Saund.), *Phthorimaea operculella* (Zell.), *Homoeosoma humeralis* (Butl.), *Plutella maculipennis* Curtis, *P. capparidis* Swezey, *Phlyctaenia despecta* (Butl.), *Lineodes ochrea* Walsm., *Batrachedra cuniculator* Busck, and *Petrochroa dimorpha* Busck.

SCELIONIDAE

***Phanurus beneficiens** (Zehnt.)

Arch. Java Suikerind., IV, p. 487, Pl. VI, Figs. 16-24, 1896.

Introduced from Japan in 1928 as an egg-parasite of the rice borer, *Chilo simplex* (Butl.). About 40,000 were reared and liberated. It has not yet been recovered in the field.

Telenomus rhopali Perkins

Fauna Hawaiiensis, II, Part VI, p. 618, 1910.

Telenomus paractias Perkins

Fauna Hawaiiensis, II, Part VI, p. 619, 1910.

These two species are parasitic in the eggs of a bug, *Rhopalus hyalinus* (Fab.) on Oahu. They are rarely met with, however.

Telenomus despiciendus Perkins

F. H., II, Part VI, p. 618, 1910.

Telenomus adelphus Perkins
F. H., II, Part VI, p. 619, 1910.

These two species also occur on Oahu, but are very rare. No doubt they are parasitic on bug eggs of some kind.

Telenomus vulcanus Perkins
F. H., II, Part VI, p. 619, 1910.

This species occurs at Kilauea, Hawaii. It has been reared from the eggs of *Nysius* sp. in the flower heads of *Raillardia* sp.

Telenomus nawai Ashmead
Journal N. Y. Ent. Soc., XII, p. 72, 1904.

This is parasitic in the eggs of *Spodoptera mauritia* (Boisd.). It is an immigrant from Japan, first discovered on the grounds of the Experiment Station of the Hawaiian Sugar Planters' Association in 1926. It was reared by thousands in the insectary and distributed widely on the other islands. It is known to have become well established all over Oahu of itself, and quite widely on Kauai from the colonies sent there. It has not yet been recovered from the other islands. It was described from Japan, where it was reared from undetermined Lepidoptera eggs. It has been reared from eggs of *Prodenia litura* (Fabr.) in Fiji. In Honolulu, attempts were made to rear it on various lepidopterous eggs, but with no success except on *Spodoptera mauritia*. On this species it commonly parasitizes all of the eggs of an egg cluster. One parasite issues per egg.

Baeus persordidus Perkins
F. H., II, Part VI, p. 622, 1910.

Pseudobaeus peregrinus Perkins
F. H., II, Part VI, p. 621, 1910.

Dyscritobaeus comitans Perkins
F. H., II, Part VI, p. 622, 1910.

These three species were described from Oahu. Dr. Perkins stated that he suspected them to be egg-parasites of bugs, but that theoretically they should be bred from eggs of spiders. More recently, one or more species have been reared from spider eggs at Pahala and Kilauea, Hawaii, and at Waiahole and Kaala, Oahu. The reared specimens have not been determined.

PLATYGASTERIDAE

***Aphanomerus pusillus** Perkins
Exp. Sta., H. S. P. A., Bul. I, Part 6, p. 203, 1905.

This insect was introduced from Queensland in 1904 as an egg-parasite of *Siphanta acuta* (Walker). It is now generally spread throughout the islands and quite effective in checking Siphanta.

EUPELMIDAE

Solendinia picticornis Cameron
Trans. Ent. Soc. London, p. 189, 1883.

Timberlake considers this an immigrant insect, though as yet not known elsewhere. It is parasitic in the egg capsules of a blattid, *Allacta similis* (Sauss.), and perhaps others of the smaller related roaches. It is generally distributed throughout the islands.

Anastatus koebelei Ashmead
Fauna Hawaiiensis, I, Part III, p. 320, 1901.

This is also considered as an immigrant. Is known on Oahu and Maui. Parasitic in the eggs of two locustids: *Elimaea punctifera* (Walk.) and *Holochlora japonica* Brunner.

Eupelmus rhyncogoni Perkins
Proc. Haw. Ent. Soc., I, Part 4, p. 132, 1907.

Parasitic on the eggs of a native weevil, *Rhyncogonus blackburni* Sharp. Known only on Mt. Tantalus, Oahu, where it was bred quite abundantly by Mr. Giffard in 1907.

Eupelmus axestops Perkins
Fauna Hawaiiensis, II, Part VI, p. 638, 1910.

Widely distributed on Oahu. Bred by F. W. Terry from eggs of *Banza parvula* (Walker).

Of the numerous endemic species of Eupelmus in Hawaii possibly several more are egg-parasites. One (an unidentified specimen) has been reared from a cricket egg in Labordea leaf.

PTEROMALIDAE

***Scutellista cyanea** Motsch.
Etud. Entom., VIII, p. 172, T. 1, F. 17, 1859.

Introduced from California in 1905 as a parasite of *Saissetia nigra* (Nietn). The larva feeds on the eggs beneath the scale. The

adult parasite issues through a hole in the back of the scale. Often a great many of the scales are seen to have the holes from which the parasites have issued. It is a very valuable parasite.

EULOPHIDAE

***Ootetrastichus beatus** Perkins

Exp. Sta. H. S. P. A., Ent. Bul., I, Part 8, p. 263, Pl. XX, Fig. 8, 1906.

Introduced from Fiji in 1905 as a parasite of the sugar cane leafhopper, *Perkinsiella saccharicida* Kirkaldy. It became generally spread throughout the sugar plantations and was an active factor in the reduction of the leafhopper pest. It still maintains its existence even though the pest is scarce. Its larva feeds within one egg and after finishing it eats the remaining eggs of the cluster of leafhopper eggs. It pupates within the leaf, and when mature bores a little round hole for emergence through the epidermis of the leaf.

***Ootetrastichus formosanus** Timberlake

Proc. Haw. Ent. Soc., IV, p. 558, 1921.

Introduced from Formosa in 1916 as an egg-parasite on the sugar cane leafhopper. Has similar habits to *O. beatus* and has been about equally as valuable.

APHELINIDAE

Centrodora xiphidii (Perkins)

Exp. Sta. H. S. P. A., Bull. I, Pt. 8, p. 264, 1906.

Parasitic in the eggs of the locustid *Conocephalus saltator* (Sauss.). A very effective parasite occurring on all of the islands of the Hawaiian group. Not known elsewhere yet although it must be an immigrant. Nine to fourteen parasites develop per host egg. A fuller account is given in Exp. Sta. H. S. P. A., Bull. I, Pt. 7, p. 214, 1905.

TRICHOGRAMMATIDAE

Trichogramma minutum Riley

Third Ann. Rep. Insects of Missouri, p. 158, fig. 72, 1871.

Has been known for a long time in Hawaii, and is generally distributed. It is parasitic in the eggs of many species of Lepidoptera, especially *Omiodes blackburni* (Butl.), *O. meyricki* Swezey,

O. accepta (Butl.), *Amorbia emigratella* Busck, *Archips postvittanus* (Walk.), *Lycaena boetica* (Linn.), *Vanessa cardui* (Linn.), *V. tammeamea* Esch.

Trichogramma semifumatum (Perkins)

Fauna Hawaiiensis, II, Pt. VI, p. 659, 1910.

Parasitic in the eggs of Lepidoptera, having been reared from undetermined noctuid eggs on Haleakala, Maui; *Scotorythra* sp. eggs on Molokai; eggs of *Celerio calida* (Butl.), *C. lineata* (Fab.), *Herse cingulata* (Fab.), *Bactra straminea* (Butl.) and *Spheterista asaphopis* Meyrick on Oahu. It has also been collected on Hawaii.

***Neotrichogramma japonicum** (Ashmead)

Journ. N. York Ent. Soc., XII, p. 165, 1904; Girault, Tr. Am. Ent. Soc., 37, p. 40, 1911.

Introduced from Japan in 1928 as a parasite on the eggs of the rice borer, *Chilo simplex* (Butl.), which had recently become established as a bad pest in rice fields. Many thousands were reared for liberation. Parasitized Chilo eggs have been taken in the field, indicating that this parasite has become established.

Trichogramma sp.

Another species of Trichogramma was introduced and reared along with the preceding species. At present the identity of this species has not been determined.

***Uscana semifumipennis** Girault

Trans. Am. Ent. Soc., 37, p. 23, 1911.

Introduced from Texas in 1910 as a parasite on bruchid eggs. Is widely spread in the islands, and a valuable factor in control of the bruchids infesting algaroba pods. It has been recorded from the eggs of *Caryoborus gonagra* (Fab.), *Bruchus prosopis* Leconte, *B. sallaei* Sharp, *B. limbatus* (Horn), *B. pruininus* Horn, *B. chinensis* Linn. and *B. phaseoli* Gyll. Sometimes as high as 90 per cent of bruchid eggs have been found parasitized.

Brachistella lutea (Fullaway)

Proc. Haw. Ent. Soc., III, p. 22, 1914.

Parasitic in the eggs of *Draeculacephala mollipes* (Say). Has also been reared from the eggs of *Conocephalus saltator* (Sauss.). Known only on Oahu. First collected in 1913.

Oligosita caerulocephala (Fullaway)

Proc. Haw. Ent. Soc., III, p. 23, 1914.

Parasitic in the eggs of *Draeculacephala mollipes* (Say). Known only on Oahu. First collected in 1912.

Oligosita hilaris (Perkins)

Fauna Hawaiiensis, II, Pt. VI, p. 658, 1910.

Known first in 1904 in Honolulu. Collected by Dr. Perkins in foreign grasses. It is probably parasitic on the eggs of some leafhopper occurring on the grass, but has not been actually reared.

Ittys perditrix (Gahan)

Proc. Ent. Soc. Washington, 20, p. 25, 1918.

There is only one record of this insect, reared by Timberlake from eggs of *Nesophrosyne maritima* Kirkaldy in Dodonaea leaves, Makua, Oahu, 1916. It was originally reared from eggs of *Stictocephala festina* (Say) at Tempe, Arizona.

Aphelinoidea xenos Timberlake

Proc. Haw. Ent. Soc., V, p. 414, 1924.

Reared from eggs of *Sogata paludum* (Kirk.) in Honolulu in 1913 and 1914.

Ufens elimaeae Timberlake

Proc. Haw. Ent. Soc., VI, p. 525, 1927.

An egg-parasite of *Elimaea punctifera* (Walk.), first recorded in Honolulu in 1910. So far it is known only on Oahu, where it has been reared from eggs collected at such widely separated localities as: Honolulu, Mt. Tantalus, Barber's Point and Waianae. A dozen or more may issue from one egg. It has also been reared from eggs of *Holochlora japonica* Brunner.

Megaphragma mymaripenne Timberlake

Proc. Haw. Ent. Soc., V, p. 414, 1924.

This minute insect was first collected by Pemberton associated with thrips in the forest at Mountain View, Hawaii, Jan., 1920. The only other record is March 29, 1927, when the writer collected two specimens associated with thrips on a leaf of croton bush at the Experiment Station, H. S. P. A., Honolulu. It is suspected of being a parasite in the eggs of thrips.

Alaptus immaturus Perkins

Exp. Sta. H. S. P. A., Ent. Bull., I, Pt. 6, p. 197, 1905.

This is a parasite of eggs of one or more undetermined psocids commonly occurring on cane leaves, but also occurring on leaves of other plants, especially ornamental shrubs. It was first reared on Oahu in 1905; and taken in Hilo, Hawaii, in 1913. It is probable that it occurs on all the other islands. Timberlake suggests that it was unintentionally introduced at the time of introduction of the cane leafhopper egg-parasites in 1904.

Alaptus globosicornis Girault

Ann. Ent. Soc. Am., I, p. 188, 1908.

Reared from eggs of the common psocid, *Atropis divinatoria* at Honolulu and other localities on Oahu. A single male was captured by Osborn at Hakalau, Hawaii, May, 1914. More recently collected on Maui by the writer. Perhaps it is well distributed in the islands.

Alaptus globosicornis var. **hawaiiensis** Girault

Mem. Queensland Museum, I, p. 124, 1912.

This variety is based on a slide mount dated Honolulu, Aug. 3, 1900.

Alaptus sp.

An undetermined species has been collected at Hakalau, Hawaii, and at Honolulu on window. It may possibly be another parasite of psocid eggs.

Alaptus sp.

Apparently another different species was reared from eggs of a native psocid on dead twigs of the koa tree at Olinda, Maui, Feb. 10, 1927.

Leimacis peregrina Perkins

Fauna Hawaiiensis, II, Pt. VI, p. 661, 1910.

Described from material collected in Honolulu by Dr. Perkins. Habits not known, but it is possibly an egg-parasite.

Gonatocerus mexicanus Perkins
Exp. Sta. H. S. P. A., Ent. Bull., 10, p. 21, 1912.

First collected in Honolulu in 1914. Reared from eggs of *Draeculacephala mollipes* (Say) at Kapiolani Park, Honolulu, in 1915.

Gonatocerine

One specimen collected on window in Honolulu, Nov., 1915, and another one March, 1924.

***Anagrus frequens** Perkins
Exp. Sta. H. S. P. A., Ent. Bull., I, Pt. 6, p. 198, 1906.

Introduced from Queensland in 1904 as a parasite on the eggs of the sugar cane leafhopper. It became generally spread in the islands and was of value in checking the leafhopper pest. Each parasite larva fed within a leafhopper egg and when mature gnawed a tiny round hole out through the leaf epidermis. The cluster of these exit-holes in the cane leaves indicated where eggs had been destroyed by this parasite. It has been reared from other leafhopper eggs also, especially the corn leafhopper, *Peregrinus maidis* (Ashm.). Hosts of less importance are: *Sogata paludum* (Kirk.), *Kelisia sporobolicola* Kirk., *Ilburnia leahi* (Kirk.). At present, it is seldom found on the cane leafhopper eggs, the latter are scarce anyway, but is working more on the eggs of the corn leafhopper.

Anagrus sp.

Another species recorded as reared from eggs of *Peregrinus maidis* in Honolulu in 1916.

***Paranagrus optabilis** Perkins

***Paranagrus perforator** Perkins
Exp. Sta. H. S. P. A., Ent. Bull., I, Pt. 6, p. 199, 1905.

These two species were introduced from Queensland in 1904 as egg-parasites of the sugar cane leafhopper. The former increased greatly and in a few years was established generally throughout the sugar cane plantations of the islands and was the most valuable factor in the reduction of the leafhopper pest. The parasitism of the eggs often was found to run as high as 50 per cent, and even to 75 and to 80 per cent. Since the introduction of

the bug *Cyrtorhinus mundulus* (Breddin) in 1920, which brought about still more effective reduction of the leafhopper, *P. optabilis* has become very scarce, corresponding to the scarcity of the leafhopper eggs. *P. perforator* never became of much importance, though it was established and met with for a time, after a few years was not noticed. It has been reared from the eggs of another leafhopper, *Aloha ipomoeae* Kirkaldy, on morning-glory vines.

***Paranagrus osborni** Fullaway
Proc. Haw. Ent. Soc., IV, p. 53, 1919.

Introduced from the Philippines in 1916 as an egg-parasite of the corn leafhopper. It operated as an additional check on this pest. It is very difficult to distinguish this species from *P. optabilis*.

Polynema reduvioli Perkins
Exp. Sta. H. S. P. A., Ent. Bull., I, Pt. 6, p. 196, 1905.

Reared from eggs of *Reduviolus capsiformis* (Germ.) in Honolulu in 1905; also collected on Kauai the same year. Recorded from Hawaii in 1910, and on Midway and Ocean Islands in 1923. Considered by Timberlake to be an immigrant insect.

Polynema ciliata Perkins
Fauna Hawaiiensis, II, Pt. VI, p. 666, 1910.

Recorded from Oahu as parasitic in the eggs of a small delphacid.

Polynema jassidarum Perkins
Fauna Hawaiiensis, II, Pt. VI, p. 666, 1910.

Recorded from Oahu as parasitic on eggs of a jassid.

Eleven other native species of Polynema are recorded in the Fauna Hawaiiensis, II, Pt, VI, pp. 661-667, 1910. No doubt all are egg-parasites either of native delphacids or jassids, or possibly some species of bugs. They are distributed as follows: *terrestris, scrutator, rubriventris, tantalea, oahuensis, triscia, apicalis* and *perforator* from Oahu; *gigas, pyrophila* and *nana* from Hawaii.

Polynema saga (Girault)
Tr. Am. Ent. Soc., XXXVII, p. 296, 1911.

This species was discovered in Honolulu in 1928 as an egg-parasite of *Euscelis stactogalus* Am., whose presence in Honolulu was first made known at the same time.

Polynema sp.

A minute species, probably a Polynema, was reared from eggs of a native psocid on dead koa twigs, Olinda, Maui, by the writer in 1927.

DIPTERA

DROSOPHILIDAE

Titanochaeta ichneumon Knab

Insecutor Inscitiae Menstruus, II, p. 168, 1914.

Reared from spider egg cases at Pahala, Hawaii, in 1908 and 1918; and Mountain View, Hawaii, in 1912.

Drosophilid (Undetermined species)

Reared from spider egg cases at Hamakua, Hawaii, 1907; Kailua, Hawaii, 1909; Pahala, Hawaii, 1915, 1916, 1918; Mt. Tantalus, Oahu, 1915; Kalihi, Oahu, 1923; Manoa, Oahu, 1924.

HEMIPTERA

MIRIDAE

***Cyrtorhinus mundulus** (Breddin)

Deutsch. Ent. Zeit., p. 106, 1896.

Introduced from Queensland and Fiji in 1920 as an enemy to the sugar cane leafhopper. Both the young and the adult bugs live by sucking the contents of the leafhopper eggs. After its introduction it proved to be a very valuable check on the leafhopper, and completed its reduction to a scarcity by which it is no longer an injurious pest of any consequence.

Further Notes on the Forest Insects of Molokai

BY O. H. SWEZEY AND E. H. BRYAN, JR.

(Presented at the meeting of Dec. 10, 1928)

A second expedition to the mountains of east Molokai was made by the authors, from Bernice P. Bishop Museum, July 17 to 31, 1927. Through the courtesy of Mr. James Munro, headquarters were made in Mr. Munro's mountain house, at an elevation of 1500 feet on the ridge between Kainalu and Kahawaiiki gulches, at the southeastern end of the island. From here excursions were made, as weather permitted, into the surrounding wooded region. Due to the precipitous walls of the gulches, the dense character of the undergrowth, and the wetness, only a comparatively small area was explored, and the highest elevation reached was only 3100 feet, just east of Puu Ohelo. But an interesting and representative collection of insects was made, together with numerous notes concerning their relation to the native flora.

The mountain house is located on a small flat, on the edge of the native forest, just above the dry, open, grass and weed covered forehill, the lower slope of which is planted to pineapples. On a second small flat, behind and above the house is an area of open bogs, with patches of bananas and scattered scrub. Above this the numerous small ridges are thickly covered with such plants and trees as Metrosideros, Byronia, Coprosma, Suttonia, Gouldia, Pelea, Straussia, Perottetia, Broussaisia, Antidesma, Wikstroemia, Cheirodendron and Cibotium tree ferns, intertwined with ieie vine (Freycinetia), Smilax, maile (Alyxia), staghorn and other ferns, herbs, grass, and weeds. Here and there was found a single specimen of some unusual tree, such as a large Tetraplasandra, on the flat, near the house.

Higher up, the forest becomes more luxuriant, because of the moisture, the trees having numerous epiphytes, and being festooned with moss and hepatics. Many of the species of plants, found lower down, persist, but staghorn fern ceases to grow, lehua (Metrosideros) is no longer dominant, and moisture loving species are added to the list. The principal trees of the upper rain forest are

here: Straussia, Pelea, Cheirodendron, Suttonia, Gouldia, Coprosma, Pipturus; and beneath them an undergrowth of species of Astelia, tall Peperomias, Cibotium and other ferns, festoons of Smilax, and dense tangles of ieie vine (Freycinetia).

A little collecting was done in the lowlands, both at Kainalu and about Kaunakakai, especially in the homestead area to the west. This collecting was mainly along the roadsides and in cultivated fields and weed patches. In this way a few new records of immigrant arrivals were made.

Mr. A. M. Adamson, entomologist with the Pacific Entomological Survey, accompanied by Dr. C. Montague Cooke, Jr., made a trip to the Molokai Mountains from the Bishop Museum, June 18 to 23, 1928. He collected insects in the region about the head of Waikolu Valley, visited by the authors, December, 1925 (See Proceedings Hawaiian Entomological Society, Vol. 6, pp. 411-22, 1927). Determinations of many of the specimens collected by Mr. Adamson are included in the following list. For these the locality is given. Those without locality are from the Kainalu region and were collected by the authors.

HYMENOPTERA

ICHNEUMONIDAE

Evania sericea Cameron, 1.
Amblyteles koebelei (Swezey), 1 Kawela (Adamson).
Echthromorpha fuscator (Fabricius), 19; 4 Kamiloloa, Waikolu (Adamson), 1 bred ex pupa of *Amorbia emigratella* by Adamson.
Ephialtes hawaiiensis (Cameron), 1; 1 Kamiloloa (Adamson).
Pristomerus hawaiiensis Perkins, 21, one ex *Heterocrossa trigononotata*. 2 ex Heterocrossa in Clermontia fruits.
Angitia blackburni (Cameron), 1 Kaunakakai; 1 Waikolu (Adamson).
Cremastus hymeniae Viereck, 8, 2 ex *Omiodes scotaea*.
Hyposoter exiguae (Viereck), 1 Waikolu (Adamson).
Atrometus molokaiensis Ashmead, 1.
Atrometus flavifrons Ashmead, 1.
Casinaria infesta (Cress.), 1 Kamiloloa (Adamson).

ALYSIIDAE

Aphaereta muscae Ashmead, 4.

BRACONIDAE

Chelonus blackburni Cameron, 2; 1 Waikolu (Adamson).
Lysiphlebus testaceipes Cresson, 1 ex *Aphis medicaginis* on *Phaseolus semierectus* at sea level.

BETHYLIDAE

Sclerodermus sp., 21 ex Neoclytarlus in Smilax.
Sierola spp. (2 or 3 species), 8.
Epyris extraneus Bridwell, 1, at sea level.

DRYINIDAE

Pseudogonatopus perkinsi (Ashmead), 4.

SCELIONIDAE

Anteris sp., 1.

PLATYGASTERIDAE

Aphanomerus pusillus Perkins, 3 ex eggs of *Siphanta acuta*.

FIGITIDAE

Hypodiranchus sp. ? 11.
Eucolia impatiens (Say), 1.

CHALCIDIDAE

Brachymeria obscurata (Walker), 12, mostly in tomato patch at coast. 2 Kamiloloa (Adamson).
Stomatocerus pertorvus Gir., 1 tomato patch, 2 pineapple fields.

PTEROMALIDAE

Zatropis tortricidis Crawford, 1 ex *Cremastobombycia lantanella*.

EURYTOMIDAE

Eurytoma sp., 1.

MISCOGASTERIDAE

Tomocera californica Howard, 1; 1 Kawela (Adamson).
Allolelaps sp. ? 1.

SPALANGIIDAE

Spalangia cameroni Perkins, 8 ex hornfly puparia in cow manure.

EUPELMIDAE

Eupelmus ombrias Perkins, 1.
Eupelmus parombrias Perkins, 1.
Eupelmus sp., 1.
Eupelmus sp., 1 Kawela (Adamson).
Eupelmus sp., 1 ♂ ex Neoclytarlus in Smilax.

ENCYRTIDAE

Encyrtus infelix (Embleton), 1.
Anagyrus major Perkins, 2.
Anagyrus nigricornis Timberlake, 3 on Metrosideros.
Nesencyrtus kaalae (Ashmead), 15 ex larva of *Nesoprosopis caeruleipennis* in dead Metrosideros.
Pauridia peregrina Timberlake, 1.
Microterys kotinskyi (Fullaway), 5.
Plagiomerus hospes Timberlake, 1.
Pseudaphycus utilis Timberlake, 3 ex *Pseudococcus nipae* on guava.
Yellow encyrtid, 1.

APHELINIDAE

Aphelinus gossypii Timberlake, 1.

EULOPHIDAE

Secodella metallica (Ashmead), 2 ex Lepidopterous leaf-miner in Clermontia; 1 Kawela (Adamson).
Melittobia hawaiiensis Perkins, 20 ex pupa of *Pachodynerus simplicicornis.*
Pseudopheliminus vagans Timberlake, 1.
Sympiesis sp., 2.
Sympiesis sp., 14.
Eulophus sp. 1.
Eulophus sp. 3.
Unidentified eulophid, 8.
Unidentified eulophid, 1.

TRICHOGRAMMATIDAE

Trichogramma minutum Riley. Parasite of eggs of *Amorbia emigratella.*
Trichogramma semifumatum (Perkins), 11 ex eggs of *Scotorythra* sp.

MYMARIDAE

Polynema terrestris Perkins, 5 on Metrosideros and Wikstroemia.
Polynema rubriventris Perkins, 2 on Gouldia.
Polynema pyrophila Perkins, 1 on window of cabin.
Polynema jassidarum Perkins, 1 on Sadleria.
Polynema n. sp., 1.

FORMICIDAE

Ponera perkinsi Forel, 2.
Tetramorium guineense Fab., 6.
Cardiocondyla wroughtonii var. *hawaiiensis* Forel, 17 Kaunakakai, in alfalfa fields; 20 Kainalu.
Cardiocondyla nuda var. *minutior* Forel, 7; 1 Kaunakakai.
Prenolepis bourbonica race *hawaiiensis* Forel, 31.
Technomyrmex albipes (Smith), 15.
Pheidole megacephala (Fabr.), 1.
Plagiolepis mactavishi Wheeler, 4.
Leptogenys falcigera var. *insularis* Forel, 1 sea level.

MIMESIDAE

Nesomimesa nitida Perkins, 1 Kamiloloa (Adamson).

TRYPOXYLONIDAE

Pison hospes Smith, 2.

CRABRONIDAE

Hylocrabro tumidoventris (Perkins), 7; 1 ex nest in dead lehua; 1 Waikolu (Adamson).
Xenocrabro unicolor (Smith), 3.
Xenocrabro molokaiensis (Perkins), 6 E. Kawela (Adamson).

VESPIDAE

Polistes aurifer Sauss. 2; 2 Kamiloloa (Adamson).
Polistes macaensis (Fabr.) 1.
Polistes hebraeus (Fabr.) 1.

EUMENIDAE

Odynerus molokaiensis Perkins, 1 Kamiloloa (Adamson); 1 Halawa (Swezey).
Odynerus instabilis Perkins, 2 Kamiloloa (Adamson).
Odynerus ecostatus Perkins, 1.
Odynerus camelinus Perkins, 1.
Odynerus purpurifer Perkins, 13, sea level to 2200 feet; 2 ex nest in dead lantana.
Odynerus nigripennis (Holm.), 1 at sea coast.
Odynerus petrobius Perkins, 1 at sea coast.
Pachodynerus simplicicornis (Sauss.), nest in window of cabin; 1 pineapple field; 2 Kaunakakai.

PSAMMOCHARIDAE

Anoplius luctuosus (Cress.), 3; 5 Waikolu, Kamiloloa (Adamson).

AMPULICIDAE

Dolichurus stantoni (Ashmead), 1.

SCOLIIDAE

Scolia manilae Ashmead, sea level to 900 feet; in pineapple field.

PROSOPIDAE

Nesoprosopis facilis Smith, 1 ex nest in dead twig; 4 E. Kawela, 2 Kamiloloa, 5 Waikolu (Adamson).
Nesoprosopis caeruleipennis Perkins, 10, 2 ex nest in dead lehua.

MEGACHILIDAE

Megachile palmarum Perkins, 3 Kaunakakai.

XYLOCOPIDAE

Xylocopa varipuncta Patton, 1, Kaunakakai, in alfalfa field.

COLEOPTERA

CARABIDAE

Colpodiscus lucipetens (Blackburn), 16 at light and in dead Tetraplasandra.
Atelothrus platynoides Sharp, 43 ex Freycinetia.
About a dozen other species from the Kainalu region.
Three or four species, Kawela, Waikolu, Kamiloloa (Adamson).

HYDROPHILIDAE

Hydrobius semicylindricus (Eschscholtz), 1 in pool.
Dactylosternum subquadratum (Fairm.), 6 in banana stems.
Cercyon quisquilius (Linn.), 21 in cowdung.

DERMESTIDAE

Dermestes vulpinus Fabr., 1 Kaunakakai (Adamson).

CUCUJIDAE

Cryptamorpha desjardinsi (Guer.), 4 at light; 1 Kaunakakai (Adamson).
Silvanus surinamensis (Linn.), 1 in dried figs from Honolulu.

NITIDULIDAE

Orthostolus robustus (Sharp), 2 ex dead lobelioid.
Orthostolus germanus Sharp, 9 ex Freycinetia.
Eupetinus impressus (Sharp), 16 ex Freycinetia.
Nitidulid, 2 on banana.
Three or four other native species, 14.
Carpophilus humeralis (Fabr.), 1.

STAPHYLINIDAE

Thoracophorus blackburni (Sharp), 2 ex dead Coprosma.
Oxytelus sculptus Grav., 15 in cowdung.
Osorius rufipes Mots., 6 ex cowdung, Sadleria, etc.
Nesomedon brunnescens Sharp, 1 at light.
Philonthus scybalarius Nord., 5 in cowdung.
Myllaena familiaris Sharp, 3 ex Freycinetia.
Oligota sp., 1 ex Freycinetia.
Two or three other staphylinids.

COCCINELLIDAE

Coelophora inaequalis (Fabr.), 4 on Metrosideros, etc.; 2 Waikolu and Kamiloloa (Adamson).
Platyomus lividigaster Muls., 1 at sea level.
Rhizobius ventralis Er., 2; 1 Kamiloloa (Adamson).
Cryptolaemus montrouzieri Muls., 5 on Metrosideros, etc.; 4 Kamiloloa (Adamson).
Hyperaspis jocosa (Muls.), 3 on lantana.
Diomus notescens (Blackburn), 4 Kaunakakai and Kainalu, at sea level, on aphis on *Cassia occidentalis*.
Scymnus occellatus Sharp, Kaunakakai, on alfalfa.

ELATERIDAE

Simodactylus cinnamomeus (Boisduval), 5 on Metrosideros and pigeon peas.
Monocrepidius exsul Sharp, 6 on Metrosideros and at light.

SCARABAEIDAE

Aphodius lividus Oliv., 2 at light.
Adoretus sinicus Burm., 5 at light.

CHRYSOMELIDAE

Epitrix parvula (Fabr.), 8 on tomato vines at sea level.

TENEBRIONIDAE

Gonocephalum seriatum (Boisduval), 5 Kamiloloa (Adamson).

CIOIDAE

Cis spp. (2 or 3 species), from Freycinetia, Metrosideros and Sadleria.
Apterocis sp.

ANOBIIDAE

Mirosternus sp., 1; 1 Makakupaia (Adamson).

CERAMBYCIDAE

Neoclytarlus sp. Reared from dead stems of Smilax.

BRUCHIDAE

Megacerus alternatus Bridwell, 5 ex seeds of *Ipomoea pes-caprae*.

ANTHRIBIDAE

Araeocerus fasciculatus (De Geer), 11, sea level to 100 feet, in husk of kukui nut, etc.; 1 Kamiloloa (Adamson).

CURCULIONIDAE

Pantomorus godmani (Crotch), 1; 12 Kamiloloa (Adamson).
Acalles, sp., 1 beaten from Alyxia.
Polytus mellerborgi (Boh.), 7 ex banana plants.
Dryophthorus squalidus Sharp, 11 ex dead Clermontia and Cheirodendron.
Dryophthorus gravidus Sharp, 1 ex dead Clermontia.
Dryophthorus declivis Sharp, 6 ex dead Coprosma and Cheirodendron.
Dryophthorus modestus Sharp, 9 in dead Coprosma and in dead frond stems of *Cibotium menziesii,* and dead Cheirodendron.
Dryophthorus insignis Sharp, 6 ex dead Coprosma and Cheirodendron, and in dead frond stems of *Cibotium menziesii.*
Pentarthrum prolixum Sharp, 22 ex dead frond stems of *Cibotium chamissoi* and *Cibotium menziesii.*
Oxydema fusiforme Woll., 5 in drift wood.
Nesotocus n. sp., 3, larva in pith of dead Tetraplasandra.
Oodemas corticis Perkins, 3 ex dead Clermontia; 2, Waikolu under bark of lobelioid (Adamson).
Oodemas, 4 undetermined species, 16.

SCOLYTIDAE

Xyleborus sp., 3 ex Straussia.

PROTERHINUS

Proterhinus, about a dozen species on several different trees. Being studied by Dr. Perkins.

LEPIDOPTERA

Unless otherwise indicated, the specimens were taken at light at the cabin, Kainalu, about 1500 feet elevation.

CARADRINIDAE

Eriopygodes euclidias (Meyrick), 1.
Agrotis chersotoides (Butler), 1.
Feltia dislocata (Walker), 1 Kaunakakai.
Euxoa hephaestaea (Meyrick), 2.
Euxoa charmocrita Meyrick, 2.

PLUSIADAE

Plusia chalcites Esp., 1.
Nesamiptis obsoleta (Butler), 3.
Adrapsa manifestalis (Walker), 1.

HYDRIOMENIDAE

Eucymatoge monticolans (Butler), 8; two of these were reared from larvae on lehua leaves. Similar larvae were found feeding on lehua flowers, but failed to rear.

SELIDOSEMIDAE

Sisyrophyta gomphias Meyrick, 4.
Scotorythra syngonopa Meyrick, 1 reared from larva on *Antidesma platyphyllum.*
Scotorythra diceraunia Meyrick, 2.
Scotorythra oxyphractis Meyrick, 2.
Scotorythra macrosoma Meyrick, 1.
Scotorythra brachytarsa Meyrick, 3.
Scotorythra rara (Butler), 4.

SPHINGIDAE

Celerio perkinsi Swezey, 2, one of them reared from a green caterpillar on *Straussia kaduana.*

LYCAENIDAE

Thecla echion Linn., 1 reared from lantana flowers.

PHYCITIDAE

Genophantis iodora Meyrick, 1.

PYRAUSTIDAE

Omiodes demaratalis (Walker), 1 caught in grassland.
Omiodes musicola Swezey, 1.
Omiodes asaphombra Meyr., Larva on Joinvillea.
Phlyctaenia hyacinthias Meyrick, 1.
Scoparia rhombias Meyrick, 1.

GELECHIADAE

Aristotelia sp. Leafminer in Gouldia.
Aristotelia sp. Leafminer in Coprosma.
Aristotelia sp. Leafminer in Antidesma.
Catamempsis decipiens Walsm. Larvae in crown of Freycinetia.

HYPONOMEUTIDAE

Neelysia argyresthiella Walsingham, 4.
Hyposmocoma phalacra Walsingham, 2.
Hyposmocoma lupella Walsingham, a larval case collected on *Freycinetia arnotti.*
Hyposmocoma chilonella Walsingham, 2 reared from larvae in dead *Smilax sandwicensis* and Coprosma.
Hyposmocoma chilonella ocellata Walsingham, 1 reared from dead Wikstroemia.
Hyposmocoma chilonella venosa Walsingham, 1 reared from dead Wikstroemia.
Hyposmocoma insinuatrix Meyrick, 2 reared from dead *Smilax sandwicensis.*
Hyperdasys cryptogamiellus Walsingham, 2 reared from dead lehua and lantana.
Euperissus cristatus (Butler), 2 reared from pith of dead *Freycinetia arnotti.*
Diplosara lignivora (Butler), larval case in rotten wood of *Tetraplasandra hawaiiensis.*

CARPOSINIDAE

Heterocrossa trigononotata Walsingham, reared from terminal bud of lehua.

TORTRICIDAE

Amorbia emigratella Busck, 1.

TINEIDAE

Opostega sp. Leafminer in Pelea.
Philodoria splendida Walsingham, 10 swept from foliage of lehua; a leafminer on that tree.
Philodoria auromagnifica Walsingham, 2 leafminers reared from leaf of Suttonia.
Philodoria floscula Walsingham, 1 collected on *Pipturus albidus*. Probably a leafminer on it as the leaves had mines in them, but none was reared.
Bedellia oplismeniella Swezey, 3 reared from mines in leaves of a grass, *Oplismenus compositus*.
Opogona omoscopa (Meyrick), 1. Its larvae common in rotten bark and wood.
Cremastobombycia lantanella Busck, 3; leafminer in lantana.

CYGNODIIDAE

Petrochroa dimorpha Busck, 1.

DIPTERA

PSYCHODIDAE

Psychoda alternata Say, 14 ex ferns.

CHIRONOMIDAE

Chironomus hawaiiensis Grimshaw, 2 near Kaunakakai about flume, in which the larvae (blood worms) were numerous.
Ceratopogon sp. 22.

CULICIDAE

Aedes albopictus (Skuse) [= *A. scutellaris*], 1.
Culex quinquefasciatus Say, 3.

MYCETOPHILIDAE

Sciara molokaiensis Grimshaw, 6.

STRATIOMYIDAE

Neoexaireta spinigera (Wied.), 11, 2 Waikolu (Adamson).

DOLICHOPODIDAE

Lianculus metallicus Grimshaw, 1 Kamiloloa (Adamson).
Dolichopus exsul Aldrich, 97, very abundant about the open bogs at 1500 feet, and numerous over whole region up to 2500 feet.
Medeterus sp., 3 Waikolu (Adamson).
Dolichopodid, 64.

PIPUNCULIDAE

Pipunculus molokaiensis Grimshaw, 12.
Two other species, 3.

SYRPHIDAE

Volucella obesa (Fabr.), 4 Waikolu (Adamson)
Eristalus arvorum (Fabr.) 2, 2 Waikolu (Adamson).
Eumerus marginatus Grimshaw, 2.
Syritta oceanica (Macquart), 2.
Ischiodon scutellaris (Fabr.) [known as *Xanthogramma grandicornis*], 1 Kaunakakai.
Allograpta obliqua (Say), 3 Kamiloloa, 2 Waikolu, 1 Kawela (Adamson).

TACHINIDAE

Archytas cirphis Curran, 4, 1 Kamiloloa (Adamson).

SARCOPHAGIDAE

Sarcophaga pallinervis Thomson, 17, 1 Kawela, 1 Waikolu, 1 Kamiloloa (Adamson).

MUSCIDAE

Haematobia irritans (Fabr.), the horn fly, 9.
Musca domestica Linn. 1.

CALLIPHORIDAE

Chrysomyia megacephala Fabr., 1 Waikolu (Adamson).
Prosthetochaeta robusta Grimshaw, 49.
Discritomyia, 2 species, 10.

ANTHOMYIDAE

Lispocephala pallidibasis Malloch, or near it, 9.
Lispocephala 2 spp., 2.
Limnophora arcuata Stein, 9.
Fannia canicularis (Linn.), 1, 9 Waikolu (Adamson).

BORBORIDAE

Limosina venalicia (Osten-Sacken), 7.
Leptocera ferruginata Stenh. 2.

TRYPETIDAE

Eutreta xanthochaeta Aldrich, 4. (the lantana gall fly).

EPHYDRIDAE

Brachydeutera hebes Cresson, 1.

DROSOPHILIDAE

Drosophila molokaiensis Grimshaw, 1.
Drosophila sp. near *olaae* Grimshaw, 1.
Drosophila mulleri, ? Sturtevant, 12 Waikolu (Adamson).
Drosophila melanogaster Meigen, 17 Waikolu (Adamson).

AGROMYZIDAE

Agromyza pusilla Meigen, 1 Kaunakakai, from Alfalfa (Serpentine leaf-miner).
Agromyza sp. near *pusilla* Meigen, 5.

HEMIPTERA

CIMICIDAE

Oechalia griseus (Burm.), 2.
Oechalia nymphs, Kamiloloa (Adamson).

LYGAEIDAE

Corizus hyalinus (Stal.), 2 at sea level.

MYODOCHIDAE

Metrarga contracta Blkb., 1 on Freycinetia.
Sephora criniger (White), 2 (Adamson).
Nesocymus calvus (White), 12 Kamiloloa, Makakupaia (Adamson).
Nysius sp., 7 on Pipturus.
Nysius sp., 2 on Sadleria.
Nysius sp., 1 on Freycinetia.
Nysius sp., 8 on Scaevola, Gouldia, Sadleria, and in pineapple field; 1 at Kaunakakai.
Nysius sp., 2 on Metrosideros.
Nysius, 2 or 3 species. Kamiloloa, Makakupaia (Adamson).

TINGITIDAE

Teleonemia lantanae Distant, 5 on lantana.

NABIDAE

Reduviolus capsiformis (Germ.), 1 Kaunakakai on alfalfa.
Reduviolus blackburni (White), 1 East Kawela (Adamson).
Reduviolus tarai Kirkaldy, 2 Kamiloloa (Adamson).
Reduviolus subrufus (White), 1 on ferns.
Reduviolus procellaris Kirkaldy, 6 on Freycinetia, etc.

GERRIDAE

Microvelia vagans White, 32 on pool at cabin.

REDUVIIDAE

Zelus reynardii Kol., 2; 1 at Kaunakakai.

MIRIDAE

Tichorhinus sp., 13 on Straussia.
Tichorhinus sp., 1 on Straussia.
Tichorhinus sp., 3 on Alyxia, Sadleria.
Tichorhinus sp., 4 on Sadleria, Freycinetia, etc.
Kamehameha lunalilo Kirkaldy, 3.
Hyalopeplus pellucidus (Stal.).
Nesiomiris hawaiiensis Kirk., 38 and 3 nymphs on *Tetraplasandra hawaiiensis*.
Engytatus geniculatus Reuter, 18 on tomato vines near coast.
Mirids, 2 or 3 species, (Adamson).
Mirid (?), 1.

ACANTHIADAE

Acanthia exulans var. *molokaiensis* Kirk., 1 (Adamson).
Acanthia humifera Kirk., 5 Kamiloloa, Makakupaia (Adamson).

NOTONECTIDAE

Buenoa pallipes (Fab.), 33 in pool near sea level.

HOMOPTERA

FLATIDAE

Siphanta acuta (Walk.), 9 on Metrosideros, Tetraplasandra, guava, etc.; 15 and 8 nymphs, Kawela, Kamiloloa, Makakupaia (Adamson).

CIXIIDAE

Iolania sp., 8 on Straussia, Freycinetia and *Cibotium menziesii.*
Oliarus hevaheva Kirk., 2 (Adamson).
Oliarus euphorbiae Giffard, 3 (Adamson).
Oliarus sp., 36 on Aspidium, Sadleria, *Cibotium menziesii.*
Oliarus sp., 2 on Sadleria.
Oliarus sp., 3.
Oliarus sp., 3.
Oliarus sp., 1.

DELPHACIDAE

Leialoha sp., 16 on Metrosideros; 2 on Metrosideros, at Kamiloloa (Adamson).
Nesodryas sp., 1 on Antidesma.
Ilburnia pipturi (Kirk.), 2 on Pipturus; 2 on Pipturus at Kamiloloa (Adamson).
Ilburnia sp., 3 on Freycinetia; 1 on Strongylodon.
Ilburnia sp., 2 on Clermontia.
Ilburnia sp., 18 on Sadleria.
Ilburnia sp., 15 on Aspidium, Gleichenia, Sadleria.

JASSIDAE

Nesophrosyne ponapona Kirk., 5 Kamiloloa, 4 Kawela, 1 Makakupaia, on Pipturus (Adamson).
Nesophrosyne sp., 1 Kawela (Adamson).
Nesophrosyne sp., 4 on Antidesma, Suttonia.
Nesophrosyne sp., 1 on Broussaisia.
Nesophrosyne sp., 1 on Byronia.
Nesophrosyne sp., 5 on Straussia.
Nesophrosyne sp., 1 on Gouldia.
Nesophrosyne sp., 5 on Wikstroemia.
Nesophrosyne sp., 7 on Gleichenia, 3 Suttonia, 2 Gouldia, 1 Straussia, 1 Wikstroemia, 1 Freycinetia, 2 Metrosideros, 1 ferns.
Nesophrosyne sp., 8 on Aspidium, 7 on other ferns.
Amaranth jassid, 5 at Kaunakakai.

PSYLLIDAE

Kuwayama gracilis Crawford, numerous on Metrosideros.
Trioza sp., numerous on Metrosideros.
Hevaheva sp., nymphs in pits on upper surface of leaves of Pelea.
An undetermined new species very abundant on *Tetraplasandra hawaiiensis*, the nymphs on the leaves resembling coccids.

COCCIDAE

Saissetia sp., on Tetraplasandra, Straussia, Clermontia.
Ceroplastes rubens Maskell., on Metrosideros, Straussia, Antidesma.
Pseudococcus longispinus (Targ.), on Tetraplasandra.
Pseudococcus montanus Ehrhorn, on Freycinetia.

NEUROPTERA

HEMEROBIIDAE

Chrysopa microphya McLach., 4.
Chrysopa lanatus Banks, 1 on alfalfa at Kaunakakai.
Nesomicromus vagus Perkins, 1 on Straussia.
Micromus vinaceous Gerst, 4.

MYRMELIONIDAE

Formicaleo perjurus (Walker), 1 in dry ravine at Kaunakakai.

TERMITIDAE

Neotermes connexus Snyder, numerous in dead wood of nearly every kind of dead tree: Metrosideros, Straussia, Perrottetia, Freycinetia, Byronia, Coprosma, Clermontia, Gouldia, Tetraplasandra, Broussaisia, guava and lantana.
Kalotermes immigrans Snyder, numerous in dead algaroba trees at Kaunakakai.

CORRODENTIA

PSOCIDAE

Psocus distinguendus Perkins, 4 on Metrosideros and Sadleria.
Psocus lanaiensis Perkins, 4.
Undetermined psocids, 3 or 4 species.

ODONATA

LIBELLULIDAE

Pantala flavescens Fab., 1.
Nesogonia blackburni (McLach.), 1.

AGRIONIDAE

Agrion blackburni McLach., 5.
Agrion molokaiense Perkins, 2.
Agrion deceptor McLach., 9.
Agrion amaurodytum Perkins, 5.

ORTHOPTERA

BLATTIDAE

Allacta similis (Sauss.), 11.

TETTIGONIIDAE

Banza molokaiensis (Perkins), 5.
Conocephalus saltator (Sauss.), 1.
Atractomorpha ambigua Bol., 1 at coast.

GRYLLIDAE

Paratrigonidium pacificum (Scud.), 34 mostly on ferns. One with a nematode worm.
Leptogryllus apicalis Perkins, 3.
Leptogryllus deceptor Perkins, 1.

DERMAPTERA

LABIDURIDAE

Euborellia annulipes (Lucas), 1.
Chelisoches morio (Fab.), 1.
Anisolabis eteronoma Borelli, 9 Kamiloloa (Adamson).

Insects Listed per Host Tree

METROSIDEROS COLINA POLYMORPHA

Hymenoptera

Nesoprosopis caeruleipennis Perkins, nest in rotten branch.
Hylocrabro tumidoventris (Perkins), nest in rotten branch, stored with dolichopodid flies.
Odynerus purpurifer Perkins, caught on blossoms.
Pristomerus hawaiiensis Perkins, parasite on *Heterocrossa trigononotata* in buds.
Nesencyrtus kaalae (Ashm.), parasite of larva of *Nesoprosopis caeruleipennis.*
Anagyrus nigricornis Timberlake, swept from foliage. A mealybug parasite.
Sympiesis sp., parasite of psyllids.
Polynema terrestris Perkins, swept from foliage. Parasite on leafhopper eggs.

Coleoptera

Proterhinus sp., in pith of dead twigs.
Dryophthorus sp., larvae in dead wood.

Lepidoptera

Eucymatoge monticolans (Butl.), larvae on new leaves and on flowers.
Heterocrossa trigononotata Walsm., larvae in terminal buds.
Hyperdasys cryptogamiellus Walsm., larvae in rotten wood.
Philodoria splendida Walsm., leafminer.

Hemiptera

Nysius sp., on foliage.
Siphanta acuta (Walker), on foliage and young twigs.
Leialoha sp., on foliage.
Nesophrosyne sp., on foliage.
Kuwayama gracilis Crawford, on leaves, without galls.
Trioza sp., in galls on leaves, numerous.
Ceroplastes rubens Maskell, on leaves.

Neuroptera

Neotermes connexus Snyder, in dead wood.

Corrodentia

Psocus distinguendus Perkins, on bark.

EUGENIA SANDWICENSIS

Coleoptera

Proterhinus sp., in dead twigs.
Cis sp., in dead twigs.

STRAUSSIA KADUANA

Hymenoptera

Microterys kotinskyi (Fullaway), swept from foliage. A scale parasite.

Coleoptera

Proterhinus sp., under bark.
Xyleborus sp., Ambrosia beetle. Boring in recently dead wood.

Lepidoptera

Celerio perkinsi Swezey, one reared from larva on leaves.
Scotorythra sp., larva on leaves. Failed to rear.

Hemiptera

Tichorhinus sp., two species on leaves.
Nesophrosyne sp., on foliage.
Aphid, on foliage.
Ceroplastes rubens Maskell, on foliage.
Saissetia sp., on foliage.

Neuroptera

Nesomicromus vagus Perkins, preying on aphids.
Neotermes connexus Snyder, in dead wood.

GOULDIA AXILLARIS

Hymenoptera

Eupelmus sp., swept from foliage.
Eulophid, probably a parasite of Proterhinus.
Polynema rubriventris Perkins, swept from foliage. A leafhopper egg-parasite.

Coleoptera

Proterhinus sp., under bark.
Anobiid, larvae in pith and under bark.
Oodemas sp., in dead wood.

Lepidoptera

Aristotelia sp., a leafminer.

Hemiptera

Nysius sp., on foliage.
Nesophrosyne spp., two species on foliage.

Neuroptera

Neotermes connexus Snyder, in dead wood.

Corrodentia

Undetermined psocid, on bark.

COPROSMA FOLIOSA

Coleoptera

Dryophthorus declivis Sharp, in dead wood.
Dryophthorus modestus Sharp, in dead wood.
Dryophthorus insignis Sharp, in dead wood.
Oodemas sp., in dead wood.
Cis sp., in dead wood.
Proterhinus sp., swept from dead twigs, (specimen lost).
Elaterid larva, in rotten wood.

Lepidoptera

Hyposmocoma chilonella Walsm., larva in dead wood.
Aristotelia sp., a leafminer.

Neuroptera

Neotermes connexus Snyder, in dead wood.

BYRONIA SANDWICENSIS

Coleoptera

Proterhinus sp., swept from dead twigs.

Lepidoptera

Semnoprepia sp., larva in dead wood.

Hemiptera

Nesophrosyne sp., on foliage.

Neuroptera

Neotermes connexus Snyder, in dead wood.

SUTTONIA LESSERTIANA

Coleoptera

Undetermined anobiid, larva in dead wood.

Lepidoptera

Eulia sp., larvae on leaves.
Philodoria auromagnifica Walsm., a leafminer.

Hemiptera

Nesophrosyne spp., two species on foliage.

Orthoptera

Banza molokaiensis Perkins, one pair hiding in webbed leaves.

WIKSTROEMIA FOETIDA

Hymenoptera

Figitid, swept from foliage. Probably a parasite of the leafminer.
Eupelmus sp., swept from foliage.
Anagyrus sp., swept from foliage. A mealybug parasite.
Trichogramma minutum Riley, parasite of Amorbia eggs on leaf.
Polynema terrestris Perkins, swept from foliage. A leafhopper egg-parasite.

Lepidoptera

**Euxoa hephaestea* (Meyr.), larva on leaves.
Amorbia emigratella Busck, egg mass on leaf.
Archips postvittanus (Walk.), larvae on leaves.
Hyposmocoma chilonella ocellata Walsm., larvae and pupae in rotten wood.
Hyposmocoma chilonella venosa Walsm., larvae and pupae in rotten wood.

Diptera

Agromyza sp., a leafminer.

Hemiptera

Nesophrosyne sp., swept from foliage.
Pseudococcus sp., on foliage.

Corrodentia

Undetermined psocid, on bark.

Thysanoptera

Undetermined thrips, under dead bark.

ANTIDESMA PLATYPHYLLUM

Lepidoptera

Scotorythra syngonopa Meyrick, larva on leaves. Reared.
Aristotelia sp. (?), leafminer. Failed to rear.

Hemiptera

Nesodryas sp., swept from foliage.
Nesophrosyne sp., swept from foliage.
Ceroplastes rubens Maskell, on leaves.

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* This is the moth described as *Euxoa wikstroemiae* by Swezey (Proc. Haw. Ent. Soc., IV, p. 377, 1920). Enough specimens have now been reared and collected to show sufficient variation to connect it with specimens of *haephestea*, which species was originally described from specimens collected in the N. W. Koolau Mts., Oahu. The species is now known on Oahu, Kauai and Molokai.

PIPTURUS ALBIDUS

Hymenoptera

Secodella metallica (Ashm.), parasite of leafminer.

Coleoptera

Nitidulid, swept from foliage.

Lepidoptera

Scotorythra sp., larva on leaves.
Vanessa tammeamea Esch., larva on leaves.
Philodoria floscula Walsm., leafminer.

Hemiptera

Nysius sp., on foliage.
Ilburnia pipturi (Kirk.), on foliage.

PELEA MOLOKAIENSIS

Lepidoptera

Opostega sp., leafminer.

Hemiptera

Hevaheva sp., nymphs in pits on upper surface of leaves.

BROUSSAISIA ARGUTA

Hymenoptera

Nesoprosopis facilis Sm., nest in dead twig.

Lepidoptera

Semnoprepia sp., larvae in dead wood.

Hemiptera

Nesophrosyne sp., on foliage.

Orthoptera

Banza molokaiensis (Perkins), hiding among leaves.

CHEIRODENDRON GAUDICHAUDII

Coleoptera

Dryophthorus squalidus Sharp, in rotten wood.
Dryophthorus declivis Sharp, in rotten wood.
Dryophthorus modestus Sharp, in rotten wood.
Dryophthorus insignis Sharp, in rotten wood.

Lepidoptera

Sphcterista sp., larvae on leaves.

TETRAPLASANDRA HAWAIIENSIS

Hymenoptera

Tomocera californica Howard, scale parasite. Swept from foliage.
Trichogramma semifumatum (Perkins), reared from eggs of Scotorythra under bark.

Coleoptera

Colpodiscus lucipetens (Blkb.), in cavities of dead branches.
Nesotocus sp., in dead branch.
Dryophthorus squalidus Sharp, in rotten wood.
Cryptolaemus montrouzieri Muls., predacious on mealybugs.

Lepidoptera

Scotorythra sp., egg clusters under loose bark.
Diplosara lignivora (Butl.), in rotten wood.

Hemiptera

Nesiomiris hawaiiensis Kirkaldy, numerous on foliage.
Siphanta acuta (Walker), on foliage.
Psyllid, an undetermined species very numerous on leaves. Nymphs resembling coccids.
Saissetia sp., on leaves.
Pseudococcus longispinus (Targ.), on leaves.

Neuroptera

Neotermes connexus Snyder, in dead branches.

CLERMONTIA GRANDIFLORA

Hymenoptera

Nesoprosopis facilis Sm., nest in hollow twig.
Sierola sp., swept from foliage.
Secodella metallica (Ashm.), parasite of leafminer.

Coleoptera

Carabid, in dead hollow stem.
Nitidulid, under bark.
Staphylinid, in rotten fruit.
Elaterid, larva in rotten stem.
Dryophthorus gravidus Sharp, in rotten stem.
Dryophthorus squalidus Sharp, in rotten stem.
Oodemas corticis Perkins, in rotten stem.

Lepidoptera

Heterocrossa sp., larvae in fruit.
Philodoria sp. (?), leafminer.
Opogona omoscopa (Meyrick), larvae in rotten wood.

Hemiptera

Saissetia sp., on leaves.

Neuroptera

Neotermes connexus Snyder, in dead wood.

ALYXIA OLIVAEFORMIS

Coleoptera

Proterhinus sp., swept from dead twigs.
Acalles sp., swept from dead twigs.

Hemiptera

Tichorhinus sp., swept from foliage.

FREYCINETIA ARNOTTI

Coleoptera

Atelothrus platynoides Sharp, at axils of leaves.
Nitidulid, at axils of leaves.

Lepidoptera

Catamempsis decipiens Walsm., larvae in crown of living plant.
Euperissus cristatus (Butl.), larvae in pith of dead stems.

Hemiptera

Anthocorid, predacious bug.
Ilburnia sp., on foliage.
Pseudococcus montanum Ehrhorn, between leaves of crown.

Neuroptera

Neotermes connexus Snyder, in dead stems.

JOINVILLEA ADSCENDENS

Lepidoptera

Omiodes asaphombra Meyrick, larvae on leaves.

SMILAX SANDWICENSIS

Hymenoptera

Nesoprosopis facilis Sm., nest in beetle burrow in dead stem.
Sclerodermus sp., parasite of Neoclytarlus.
Eupelmus sp., parasite of Neoclytarlus.

Coleoptera

Neoclytarlus sp., larvae boring in dead stems.
Oodemas sp., in dead stems.
Proterhinus sp., in dead stems.

Lepidoptera

Hyposmocoma chilonella Walsm., larvae in dead stems.
Hyposmocoma insinuatrix Meyrick, larvae in dead stems.

ASTELIA VERATROIDES

Hymenoptera

Cremastus hymeniae Viereck, parasite of Omiodes larvae.

Coleoptera

Carabidae, two species in axils of leaves.

Lepidoptera

Omiodes scotaea (Hampson), larvae on leaves.

MUSA SAPIENTUM

Coleoptera

Polytus mellerborgi (Boh.), at base of stems. Larvae in corms.
Dactylosternum subquadratum (Fairm.), in decaying stems. A predator.
Cryptamorpha desjardinsi (Guer.), on dead leaves.

Dermaptera

Labia sp., on the leaves. A predator.

CIBOTIUM CHAMISSOI

Coleoptera

Pentarthrum prolixum Sharp, in dead frond stems.
Proterhinus sp., in dead frond stems
Cis sp., in dead frond stems.

CIBOTIUM MENZIESII

Coleoptera

Carabidae, two or three species in dead frond stems.
Elaterid larva, in dead frond stems.
Pentarthrum prolixum Sharp, in dead frond stems.
Dryophthorus modestus Sharp, in dead frond stems.
Dryophthorus insignis Sharp, in dead frond stems.
Oodemas sp., in dead frond stems.
Proterhinus sp., in dead frond stems.

Hemiptera

Oliarus nymph, in dead frond stems.

SADLERIA CYATHEOIDES

Hymenoptera

Polynema jassidarum Perkins, an egg-parasite of jassid eggs.

Coleoptera

Proterhinus sp., in dead frond stems.
Cis sp., in dead frond stems.

Hemiptera

Nysius sp., swept from fronds.
Mirid, swept from fronds.
Oliarus sp., swept from fronds.
Ilburnia spp., two species, swept from fronds.
Nesophrosyne sp., swept from fronds.

ASPIDIUM CYATHEOIDES

Hymenoptera

Polynema sp., parasite of leafhopper eggs.

Lepidoptera

Batrachedra sp., larvae feeding on sporangia.

Hemiptera

Oliarus sp., swept from fronds.
Nesophrosyne sp., swept from fronds.

GLEICHENIA DICHOTOMA

Hemiptera

Nysius sp., swept from fronds.
Reduviolus sp., swept from fronds.
Ilburnia sp., swept from fronds.
Nesophrosyne sp., swept from fronds.

Notes on the Habits of the Cockroach-Hunting Wasps of the Genus Ampulex, Sens. Lat., With Particular Reference to Ampulex (Rhinopsis) caniculatus Say

BY FRANCIS X. WILLIAMS

(Presented at the meeting of September 6, 1928)

Nearly 200 years ago Réamur, the celebrated French scientist, in his "Memoires pour servir a l'Histoire des Insectes," VI, pp. 280-284, 1742, described the "Guêpe Ichneumon," later known as *Ampulex compressa* (Fabricius) a splendid metallic blue wasp, attaining a length of nearly an inch, and that inhabits portions of Asia, Africa and some of the larger islands of the Indian ocean. It is the oldest known species of the family Ampulicidae. Réamur relates the observations of a certain M. Cossigni on the habits of this wasp, as noted in Mauritius (Île de France). The "Guêpe Ichneumon" boldly enters houses and searches among the folds of the window curtains and other places likely to conceal a "Kakkerlac" or cockroach*; when one of these blattids is found the wasp dashes at it and, seizing the anterior part in its mandibles incapacitates it by stinging it on the underside of the body. Subsequently the roach is pulled to a hole—in this case in a wall—and into which Ampulex endeavors to drag it; if failing this, because of the excessive bulk of the prey, the wasp reduces its dimensions by cutting off the wing covers and, if needs be, tears off a limb or two. Thus the roach is stored as provender for a future wasp generation.

From time to time, data on the habits of *Ampulex compressa* appear in literature. H. Lucas (Bull. Soc. Ent. France, 1879, p. CLIX) refers to the cocoon of *Ampulex*, presumably *compressa* from New Caledonia, as encased in the remains of *"Blatta americana"*. Bingham, C. T., (Fauna of British India, Hymenoptera, I, pp. 253-254, 1897) says in part: "In Burma I have frequently seen these wasps come into the house and search for their prey under boxes and furniture." This insect is well known in India and Maxwell-Lefroy in his book entitled: "Indian Insect Life,"

* This wasp appears to restrict itself to the genus *Periplaneta*, which includes some of our largest and most objectionable of household cockroaches.

pp. 207-208, speaks of it as follows: "*Ampulex compressa* Fabr. is a very beautiful insect, common in the plains. In Pusa this insect is purely arboreal in its habitat. The chief haunts are the trunks of old Peepul (*Ficus religiosa*) and fig trees, which possess numerous holes and chinks. It is not an uncommon sight to see an Ampulex hurrying along the tree trunk searching hole after hole for cockroaches and occasionally flying to a distant branch only to return and continue the search in a few seconds. As far as observed this species confines itself exclusively to species of *Periplaneta* for its prey . . ."

Referring to the biology of other species of Ampulex, Sonnerat in his "Voyage a la Nouvelle Guinée," pp. 20-24, pl. 12, 1776, Paris, writes of the habits of an Ampulex, later named in his honor as *A. sonnerati* Kohl, in the suburbs of Manila, Luzon, Philippines. This brilliant insect which he refers to as "La Mouche Bleue" (the blue fly) is about 15 millimeters or 3/5 of an inch long and was observed attacking a "Kakkerlac" over an inch long, among the ruins of a church. The roach was stung to partial paralysis, dragged into a crevice, which was then stoppered up with dirt carried thereto in the wasp's mandibles.

On the testimony of Dr. D. Sharp (Cambridge Natural History of Insects, pt. 2, pp. 114-115, 1901) Perkins gives a brief sketch on the habits of *Ampulex siberica,* now referred to as *Ampulex compressiventris* Guer. In West Africa this species enters apartments in search of cockroaches which it overcomes and stores in some convenient place, such as a keyhole. The dead bodies of cockroaches have been found with the cocoon of the wasp protruding from them.

A very readable account of the habits of *Ampulex assimilis* Kohl is given by R. W. G. Hingston in "Nature at the Desert's Edge," pp. 29-54, 1925, London. This shining blue wasp which is about 3/4 of an inch long was observed searching the trunks of date palms about Bagdad, Turkey, for the wingless female of a particular species of roach known as *Shelfordella tartara* Sauss. and which it stores and parasitizes in some convenient hole in the palm trunks.

There are a number of species of these often strikingly metallic blue or green wasps scattered over the tropics of both hemispheres. Usually, however, they are considered rare insects and this seems

particularly true of those inhabiting temperate regions where likewise endemic Blattidae are not prominent. In the Gibraltar region in the south of Spain *Ampulex* (*Rhinopsis*) *ruficollis* Cameron, small, black and with a reddish thorax, is found, while sparse over Middle and Southern Europe we find *Ampulex* (*Rhinopsis*) *fasciatus* Jurine, 7-9 millimeters long and polished black. F. Picard (Bull. Soc. Ent. France, pp. 113-116, 2 figs., 1911) regards *Ampulex fasciatus* as the most graceful of the European sphegid wasps and gives some account of its habits. In examining some stems of brambles gathered near Montpellier, southern France, he found in one of these stems five cocoons in a large gallery, excavated probably by one of the solitary bees. The polished brown cocoon of *A. fasciatus* was drawn out nipple-like at either end and was enclosed in a very loose silken cocoon, the whole being enveloped by the hollowed out body of a cockroach, *Ectobia livida* (Fabr.) upon which the wasp grub had fed. Several of these cocoons produced adult wasps. Hence *A. fasciatus* uses the deserted tunnels of other insects, stores them with *Ectobia* roaches and stoppers up the cells with debris of sorts, as shown by J. Giraud (Verhandlunger der K. K. Zool-bot Gesellschaft in Wien, 1858) and which debris it carries in its mandibles. Later, Picard (Ann. des Epiphyties, pp. 1-144, 1919) found it utilizing the borings of insects in fig trees.

This rare European wasp is well figured by L. Berland in his excellent *Hymenoptères Vespiformes,* I (Faune de France 10), p. 3, fig. 101, 1925.

Aside from their proper nesting activities there are at least two of the smaller Indian Ampulex of duller coloration, *Ampulex* (*Rhinopsis*) *ruficornis* Cam. and *R. constanciae* Cam., that show an association with *Sima rufo-nigra* Jer., a slender, fiercely stinging arboreal ant of the Myrmicinae and which these wasps as well as a mimicking spider greatly resemble and with which they safely mingle. (See Rothney, G. A. J., Trans. Ent. Soc. London, p. 354, 1889, and p. 113, 1903.) The larger, shining blue *Ampulex compressa* on the other hand is on different terms with these ants for, to quote Rothney (l. c. p. 113, 1903): "I have found it occasionally in this situation busily engaged with the workers of *Sima rufonigra,* picking them up with its mandibles and tossing them off a tree, but with a sporting air rather than any serious or deadly pur-

pose, for the ants were never in the least injured." Previously the same observer noted this wasp carrying on with the ants on a wholesale scale. (Ent. Mo. Mag., XIII, 87-88, 1876.)

AMPULEX IN THE UNITED STATES

Thomas Say (Western Quarterly Reporter, Cincinnati, II, p. 76, 1823) described *Rhinopsis caniculatus* (*Ampulex caniculata*) from Missouri. It seems pretty generally distributed in the United States east of the Mississippi and ranges into Canada. *Rhinopsis melanognathus* Rohwer (Proc. U. S. National Museum, 41, p. 464, 1912) described as a female, has proved upon subsequent examination at my request by government entomologists to be a male specimen and, as its description agrees sufficiently well with reared Missouri male *R. caniculatus,* I think it had best be regarded as a synonym of that species.

During the greater part of the summer of 1928, the writer was located at the United States Entomological Laboratory, at Webster Groves, Missouri, where he was rearing a certain egg parasite for the Experiment Station of the Hawaiian Sugar Planters' Association, Honolulu, Hawaii. Facilities for this work were kindly extended him by Mr. A. F. Satterthwait, government entomologist in charge of the laboratory, and in addition, his excellent library and experience were at his disposal, and for all of which the writer is extremely grateful.

The particular individual of *Rhinopsis caniculatus* (Say), whose activities of thirty-five days as a captive in a preserves jar furnished the chief materials for this paper, and that was the only specimen of this species captured at large by the writer, was thus discovered on the bright morning of June 12, at Webster Groves, an attractive tree-dotted suburb of St. Louis. While returning from a downtown breakfast, he observed a wasp half hopping and half flying, in rather swift progress, along a cement garden walk; it was immediately recognized as a rare and desirable insect that, however, soon took cognizance of his intentions and, ant-like, sought refuge in a narrow but extensive cavity alongside the cement. A brief, though none too hopeful watch over the spot where she had disappeared was rewarded by her reappearance; seemingly incapable of a decent take-off while on the level ground, a metal pill box was now readily clapped over her, a piece of paper slipped underneath

and the prize brought to the laboratory. A wide-mouthed jar was provided with some native cockroaches, dead leaves, pieces of bark and a cell or two fashioned of clay, to encourage nesting activities, and the wasp introduced. The arrangements, however, did not prove very satisfactory and, while Rhinopsis attacked more than one cockroach, none was stored nor parasitized. Furthermore, a larger wild roach of a species apparently not favored by the wasp and famished it seemed almost to a frenzy by long isolation in a bare test-tube, savagely pursued and sought to devour a smaller roach (*Parcoblatta virginica* [Brunner]) that had been somewhat

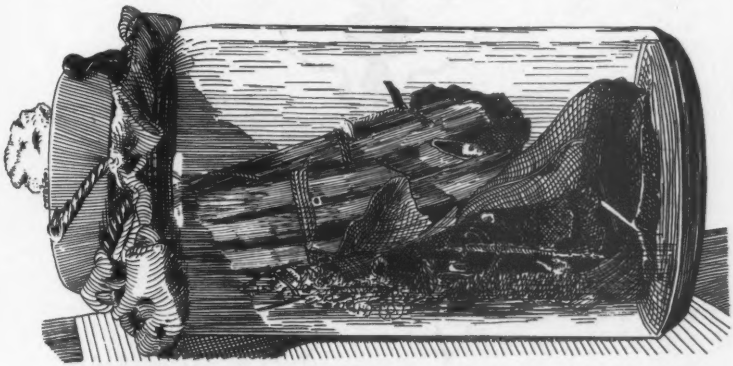


FIG. 1. In this one-quart jar *Rhinopsis caniculatus* lived for 35 days and during that time parasitized about 50 wood roaches. Drawn from a photograph by R. C. Lange.

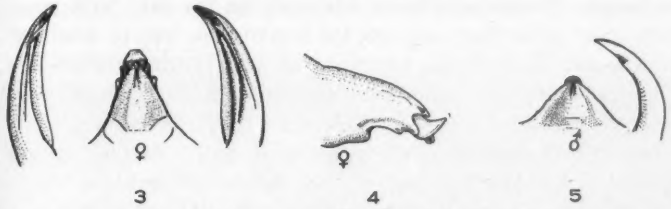
incapacitated by the wasp's sting. Hence, a quart preserves jar was substituted for the smaller receptacle and supplied only with *Parcoblatta virginica* secured from beneath debris among the trees, and with dead leaves were placed short lengths of hollowed out twigs of elderberry (*Sambucus*) stoppered at one end, and finer materials such as leaf fragments and bits of pith and cork, and finally, two little slabs of bark so tied together as to leave but a narrow space intervening, completed the wasp's domicile and hunting grounds. Drops of honey served as food for Mrs. Rhinopsis, while bread, portions of vegetables, banana peeling, sweetened water, etc., were offered the roaches, although it did not prevent them from taking an occasional nip at one another. The jar, the mouth of which was covered with cheesecloth perforated in the center for a plug of

cotton, was placed on its side on the table in the laboratory and kept from rolling about (Fig. 1). Occasionally, however, when the weather seemed too warm it was left in the basement overnight and for a time there during some afternoons. It remained, until the death of the principal actress on July 18, a continuous source of interest for the observer but, one might conclude from the oft-repeated actions of the wasp within such narrow confines and unchanging scenes, a rather drab existence for the insect!

FIG. 2. *Rhinopsis caniculatus*, female, X 5

We find in *Rhinopsis caniculatus* (Fig. 2) a wasp of graceful proportions, the female, which is the larger, sometimes attaining a length of about 12 millimeters or nearly half an inch; the head and body are black, the abdomen being highly polished; the mouth parts, antennae and legs in part reddish brown, while the rather short wings are banded by a dusky shade with the effect of leaving a middle area in the forewings of a contrasting transparency. The large head is borne on an elongate neck-like prothorax typical of the Ampulicidae and is provided with long slender mandibles, curved, very pointed and with a sharp inner edge. Both the mandibles and the clypeus (Figs. 3 and 4) are best developed in the female, for she has much need of them in her work with the cockroaches that constitute her prey. She operates her needle-tipped jaws with great precision and combines their use with the toothed, beak-like clypeus and the labrum at its tip, and can secure thereby

a very firm grip on a cockroach. The abdomen is joined to the thorax by a slim pedicel and is quite flexible, being capable of much extension and bending, as takes place when the female with her long sting seeks a vulnerable spot in the body of her victim. The clypeus of the male (Fig. 5) has no lateral teeth and the mandibles have an inner notch-like tooth before their apex.



3 4 5

FIG. 3. *Rhinopsis caniculatus*, female; mandibles, clypeus and labrum as seen from above. Greatly enlarged.

FIG. 4. *Rhinopsis caniculatus*, female; clypeus and labrum as seen from the side. Greatly enlarged.

FIG. 5. *Rhinopsis caniculatus*, male; mandible, clypeus and labrum as seen from above. Greatly enlarged.

The European *Rhinopsis fasciatus* Jurine is of nearly the same size and appearance as our *Rhinopsis caniculatus* (Say) and seems to have very similar habits.

Parcoblatta virginica (Brunner), is one of our common wood roaches and the natural prey of *Rhinopsis caniculatus*. It has a wide range over the eastern half of the United States and is of about the same size as our smaller house roaches, but the sexes differ greatly in appearance and were in fact once regarded as separate species; the male is long-winged and uniform pale brownish yellow, while the female is darker brown and quite incapable of flight owing to her very short wings that overlie the base of the abdomen. The length of the body in the male is about 11.5 to 15.4 millimeters and that of the more stoutly made female 10.3 to 12.5 millimeters; hence averaging longer than Rhinopsis and far bulkier than that wasp. It was found rather abundantly in and about Webster Groves, occurring under piles of debris, boards, stones, bark, in rotten wood, and along with other wood roaches, at trees sugared for moths. It passes the winter as a young cockroach beneath logs or other debris and reaches full growth in spring.

Mrs. Rhinopsis soon became accustomed to her cramped quar-

ters and, being more given to proceeding afoot than to flying, gave you the impression of fair contentment; she did not dash about and seldom scaled the glass sides, as would many other wasps to the contrary, in a vain attempt to escape; rather she crept about in an exploring manner, she paused, cleaned her antennae, or other parts, fed at the drops of honey or at last became involved with a cockroach. Several attacks by Rhinopsis on her prey were carefully observed at close range and the first of these may be described as follows: Early in the afternoon of July 12, the huntress encountered a desirable cockroach—the disturbed blattid penetrated a short distance between the two pieces of bark; the wasp with its fore part well raised and showing no haste, approached her victim, striving always nearly to face it; thus the uneasy roach was forced to turn from side to side or to describe circle after circle; the wasp, cool, alert and apparently sure of her quarry, always coming up alongside so that almost their legs intermingled and the wasp, her face very close to that of the other, seemed anxious to pick a quarrel, the roach avoiding her by rather jerky turnings. Probably Rhinopsis was trying to secure a hold on the base of the antennae. This uncanny procedure lasted several minutes when finally, the roach becoming weary of revolving constantly, set forth in the open; hardly had she ventured out when quick as light and unerringly, the wasp seized her; there followed a violent though very brief struggle on the part of the roach, for a sting under the soft part of the thorax quieted her. Rhinopsis had seized the roach by the side of the thorax right behind the head, the toothed clypeus protruding over and clamping down upon the top of the thorax, the sharp jaws dug into the membrane under the edge of this plate, her two forelegs grasped the thorax, while the other four rested on the lower slab of bark; the long polished abdomen, parallel with underside of her own body, and slender and flexible, its glistening apex feeling about the soft underside, stung her victim between the pairs of legs and then in the throat, and again a little later on, rather forward under the thorax (Fig. 6).

One familiar with the method of attack on the leafhoppers by dryinid wasps is immediately struck by their similarity in this respect to the ampulicid, and indeed much resemblance in form exists between wasps of these two families; the Australian genus Aphelotoma being particularly suggestive of a dryinid. The

stealthy manner of Rhinopsis is in strong contrast to that of Dolichurus, her relative, and that madly pursues the racing blattid.

Several other encounters were witnessed and in all of these the wasp's crafty approach was followed by a swift leap upon her prey as soon as the latter got in motion. Here is another scene: In the middle of the morning, Rhinopsis discovered a cockroach in a narrow space between the glass and a leaf; when their investigat-

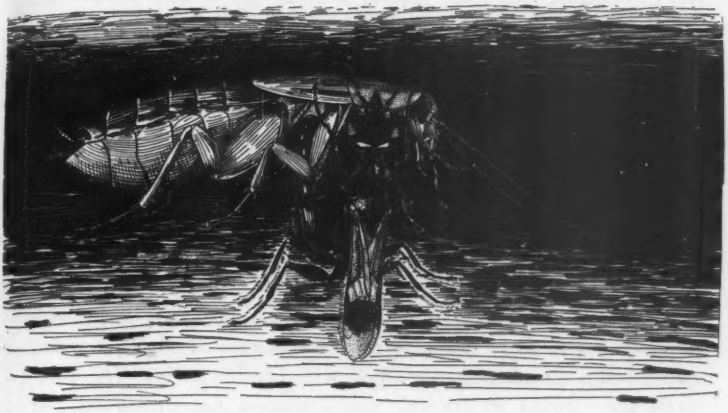


FIG. 6. *Rhinopsis caniculatus* attacking the wood cockroach, *Parcoblatta virginica*. In this grim act we see the cockroach along the edge of a shallow crevice, while the slim though powerful wasp has secured a firm hold along the thin edge of its thorax, by means of its toothed beak-like clypeus and its terminal labrum above and the needle-pointed jaws that sink into the softer tissues beneath; the wasp's telescopic abdomen is extended and the sting directed into the unprotected ventral portion between the two posterior pairs of legs, to administer the paralyzing thrust, X 5.

ing antennae touched, the wasp drew back her own and stood immovable; the blattid, however, soon becoming restless started to move off, but the wasp followed her and, executing an unerring leap of some millimeters, grasped her by one short wing pad so that in the ensuing struggle it was bent back upon the body; she finally quieted the blattid with her sting and pulled her up by the wing pad, the poor creature now hanging limp and in huddled fashion like some drunkard being led off by the shoulder. She stung it again and quite at length under the throat, leaving the sting imbedded there for a minute or more as one might use a

hypodermic needle. Then Rhinopsis, grasping her dazed victim by the base of one antenna drew this antenna through the tips of her jaws for perhaps a quarter of its length when, tightening her grip, as shown by her downbent head, exerted a pull so that the feeler was cut off at that point, and then the second antenna was similarly trimmed, the long severed portions being left where they fell. Immediately thereafter she drew the stumpy antennae of her victim through her jaws and paused at their tips so that it soon became evident that she was sucking the wounded stumps; both antennae were thus tapped more than once, and we are reminded here that many wasps suck at the wounds or mutilations they inflict upon their hosts. This procedure is invariable, although a delay may ensue before it is accomplished; the task demands some exertion on the part of the wasp, and her passively resisting victim, head pulled forward so that the neck membrane may show broadly, often winces as her sensitive and useful organs are thus severed.

Then, sometimes face to face with her victim, Rhinopsis may cleanse herself—an oft-repeated operation—she is very particular about her antennae, brushing them often simultaneously with downward sweeps of her forepaws, the palps and cheeks are also cleaned and the abdomen brushed with the hind legs. The forepaws are cleaned by passing them between her mandibles. At other times and less frequently, she sharpens her teeth by rapidly nipping at the edge of the bark slab, and calling to mind thereby, the business-like manner in which a cat sharpens her claws. Such operations, as well as resting, feeding and wandering about, are so interposed in her nesting activities that she may be a long time in putting away a cockroach. Probably, however, the maturation of the eggs within her body largely regulates the amount and speed of her work.

The roach victim, shorn of the greater length of her antennae, recovers considerably from her paralysis so that we can urge her to make a short run. Always on her feet, she clings to or rests quite naturally upon a leaf or other object, quietly awaiting the deadly plans of her mistress that, being in no particular haste may leave the paralytic in place for some time. But sooner or later Rhinopsis approaches her prize and, grasping the extreme base of one of the sensitive antennae in the tips of her mandibles pulls* or rather

* The roach resists more if the antenna is grasped far from its base.

leads it away to what is presumed to be a safe place until a proper nest hole is discovered. Many such holes are available in the bundle of hollowed-out elderberry twigs and these immediately attract her; she enters several and finally selects one. Now she returns to the roach which, having recovered yet more from the effect of the stings, may require another jab to render it more tractable; she examines it, returns to her chosen tube, then to her victim which she grasps by the base of one antenna and, walking backwards conveys it, after several stops to examine the tube, and perhaps with much difficulty with this heavy passively resisting burden, to the mouth of the tube which she now enters. She reappears directly, issues usually part way and again in the same manner grasps her prey

FIG. 7. *Rhinopsis caniculatus*. Egg glued on the base or coxal portion of one of the middle legs of the wood cockroach (*Parcoblatta virginica*). Greatly enlarged.

and backs inside with it. Here she remains for a short time—in nine observations, varying from approximately one and one-half to a little more than three minutes—during this period she has glued a polished, glassy white egg along the broad basal portion or coxa of one of the middle pairs of legs of the cockroach (Fig. 7). Now issuing head first from the tube, her first act is to clean herself, then, after a final peek at her victim she briskly sets to work filling up the tube, availing herself of the debris placed in the jar for that purpose. She seizes bits of pith, cork or fragments of dry leaves in her mandibles and runs into the tube with them; certain of the pieces are too large to be forced within and so after one or more trials they are discarded. Some of her actions in this regard almost suggest intelligence, others, however, appear to refute its existence in her. Sometimes she will fit a sliver of debris in a narrow space alongside a huge piece, or she may at last by procur-

ing a different grip, force in lengthwise a piece that she had been trying vainly to insert crosswise past an inadequate entrance. Rhinopsis exhibits great strength and speed in her work and frequently emits a squeaky buzz when striving to pack materials tightly in the tunnel, which finally is stuffed almost to overflowing.

On splitting open one of these stored elderberry twigs we will find the roach hemmed in by the debris packing but quite active, so that if freed it will run off a short distance and can only with

FIG. 8. *Rhinopsis caniculatus.* Larva about three-quarters grown, feeding with its head and thorax inserted into the body of the wood cockroach (*Parcoblatta virginica*), X 5.

considerable trouble be replaced in its cell. The delicate egg, glued in a position difficult of displacement, is practically straight, with its thicker, head end lying at the base of the roach's coxa; it was not measured but seemed less than 2 millimeters long. It hatches in between 2 or 3 days (in one case observed), the wasp grub occupying the position of the egg, and the nourishment that it sucks through the membrane of its host soon shows as a yellowish area along the middle line of the body. It increases rapidly in size, moults two or more times, and becomes more clearly segmented. Feeding at first externally on the cockroach it finally penetrates its tissues, inserting head and thorax within the body (Fig. 8).

Now we can perceive a regular streamlike motion of its darker gut, the current proceeding now forwards and now backwards. The grub's fore part may be seen within the roach, the head with active jaws perhaps within the base of one of the legs. Farther and farther it penetrates and now, fully half of the whitish body is within that of its prey of which the anterior portion has already been eaten out shell-like, and at last we see the grub after approximately five days of feeding, lying on its back in the midst of the hollowed

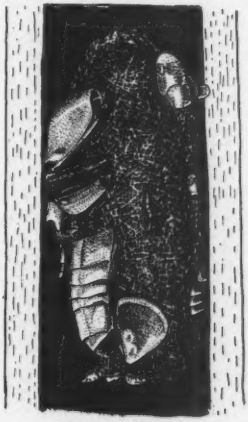


FIG. 9. *Rhinopsis caniculatus.* Loose outer or silk-spun portion of cocoon partly enveloped in the chitinized remains of its cockroach prey, in a hollow elderberry twig, X 5.

and often somewhat disordered remains among which it has already spun a few strands of silk as part of a superstructure for the cocoon of which there will be a loose, pale brown, cottony outer envelope clearly of silk (Fig. 9) and an inner, thin, smooth and brittle, parchment-like cask of rich, deep brown color and that is drawn out funnel-form at either extremity (Fig. 10). The tips of these funnels are open, but nearer their base are stoppered with a fine, straw-like material, and then by a more solid mass overlaid with a little silk. The broader end of this cask is the head end and is the one usually lying in the abdominal extremity of the cockroach skeleton.

Very likely Rhinopsis, after the manner of most solitary stinging wasps, passes the winter as a fullgrown resting larva within

the cocoon and at the approach of warm weather transforms into a pupa and ten days or a fortnight thereafter, emerges as a mature insect; in addition to this overwintering brood there is at least one and perhaps two summer broods. The wasp that for thirty-five days was confined in the quart jar, parasitized 50 or more Parcoblatta roaches and of which at least 43 produced wasps. On July 17 or thereabouts, a male issued from a cell stored June 14, the mother surviving this, her firstborn, but a day. Other emergences followed,

FIG. 10. *Rhinopsis caniculatus.* Inner papery cask of cocoon. The thicker end is the head end, X 5.

of which the last half dozen or so were males—quarrelsome fellows that fought with their strong mandibles. The stored elderberry twig sections were brought to Honolulu, arriving there on July 31, and wasps continued to issue until the last of August or first of September. During August, seven males and eight females were turned loose on the outskirts of Honolulu; we hardly expect them to become established as they are insects accustomed to a different climate and environment than ours, although they successfully attacked and parasitized *Loboptera sakalava* (Sauss.) a pale-margined, short-winged little cockroach that is almost everywhere abundant out-of-doors in Hawaii. One or two wasps were thus reared.

The operations of *Rhinopsis caniculatus* as described, were observed under rather artificial though very favorable conditions, since it is probably unusual that she could rear so large a family in her natural environment where enemies are present, the weather sometimes unfavorable, and the prey scattered and rather difficult

to capture. She is probably mainly arboreal or at least addicted to exploring old fallen timber in her search for the blattid.

While in captivity she stung and trimmed the antennae of many more cockroaches than she stored and parasitized, and she was not seen to attack the longwinged males. Occasionally at night time, the electric light would bring her out of her tube or other sleeping retreat and induce her to work as in the daylight.

From our scant knowledge of the habits of the family Ampulicidae it does not appear that *Ampulex assimilis, compressa* or *sonnerati* cut short the antennae of their victims; as far as known the egg is always glued along the lower or anterior face of one of the middle coxae. The cocoons sometimes vary in form even within the broad genus Ampulex*; in the closely related black *Rhinopsis caniculatus* and *fasciatus* the casks are drawn out nipple-like at either extremity, while in the brilliantly metallic *Ampulex assimilis* and probably also in *compressa* they are rounded at the ends. In all of these species but little of the cockroach's skeleton is devoured and the cocoon is really encased in these remains—in contrast, the ampulicid *Dolichurus* consumes the greater part of this exoskeleton and, at least in the case of *D. stantoni* (Ashmead) spins a tough cocoon that is finished off at the head end by an open-work, globiform process.

In the sphecid genera *Podium* and *Trigonopsis,* slender denizens of the American tropics and subtropics and of more or less mud-daubing habits, the cockroach prey, of which several individuals are usually placed within a single cell, is thus stored with the antennae quite uninjured, while the egg, as far as known, is affixed beneath one of the fore coxae.

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* The genus *Rhinopsis* Westwood is separated from *Ampulex* Jurine by the possession in the former of only two cubital or submarginal cells in the forewings, whereas in *Ampulex* there are three cubital cells. However, Kohl (Ann. K. K. Naturhist. Hofmuseums, Bd. VIII, pt. 3, V. 4, 1893, p. 458) has pointed out that because of the occasional disappearance of the first transverse cubital vein in *Ampulex* even of the same species, there results in but two cubital cells and hence *Rhinopsis* is untenable as a genus.

Records of Immigrant Insects for the Year 1928

BY THE EDITOR

In this issue of the Proceedings the following immigrant insects are mentioned. Those marked with an asterisk were observed for the first time in 1928. The others were previously known or collected, but were hitherto unidentified or unrecorded.

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